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The EDISON ELECTRIC INSTITUTE BULLETIN

March
1956

Published Monthly by
Edison Electric
Institute

EEI Convention Preparations

Functions of Private Enterprise in Water Resource Development

Harllee Branch, Jr.

Nuclear Energy as a Power Source

Solar-Heat Pump Possibilities

Furnishing Electric Service to Levittown Development

H. Mac Vaugh

Reports on Various Committee Meetings

J. M. Driscoll, G. H. Fiedler
G. J. Yanda, C. L. Derrick

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

(Includes Investor-Owned Companies, Cooperatives, and Government-Owned Utilities)

December, 1954-1955

SOURCE AND DISPOSAL OF ENERGY—MONTH OF DECEMBER

	1955	1954	%
NET GENERATION* (Kwhrs in Thousands)			
By Fuel Burning Plants	41,408,449	34,401,617	+20.4
By Water Power Plants	9,306,741	9,047,048	+ 2.9
Total Generation	**50,715,190**	**43,448,665**	**+16.7**
Add—Net Imports Over International Boundaries	313,345	280,130	+11.9
Less—Company Use	127,985	124,311	+ 3.0
Less—Energy Used by Producer	1,141,987	707,172	+61.5
Net Energy for Distribution	**49,758,563**	**42,897,312**	**+16.0**
Lost and Unaccounted for	6,104,732	5,804,794	+ 5.2
Sales to Ultimate Customers	**43,653,831**	**37,092,518**	**+17.7**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of December 31st			
Residential or Domestic	44,408,690	43,139,998	+ 2.9
Rural (Distinct Rural Rates)	1,648,398	1,637,535	+ 0.7
Commercial or Industrial:			
Small Light and Power	6,042,309	5,991,586	+ 0.8
Large Light and Power	287,788	280,819	+ 2.5
Other Customers	171,416	164,621	+ 4.1
Total Ultimate Customers	**52,558,601**	**51,214,559**	**+ 2.6**
KILOWATTHOUR SALES—During Month of December (Kwhrs in Thousands)			
Residential or Domestic	11,495,362	10,202,550	+12.7
Rural (Distinct Rural Rates)	698,844	637,450	+ 9.6
Commercial or Industrial:			
Small Light and Power	6,945,282	6,278,976	+10.6
Large Light and Power	22,702,445	18,249,697	+24.4
Street and Highway Lighting	452,095	416,669	+ 8.5
Other Public Authorities	876,362	820,132	+ 6.9
Railways and Railroads:			
Street and Interurban Railways	243,620	247,233	− 1.5
Electrified Railroads	189,877	193,262	− 1.8
Interdepartmental	49,944	46,549	+ 7.3
Total to Ultimate Customers	**43,653,831**	**37,092,518**	**+17.7**
Revenue from Ultimate Customers (Thousands)	**$712,806**	**$644,528**	**+10.6**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended December 31, 1955			
Kilowatthours per Customer	2,751	2,549	+ 7.9
Average Annual Bill	$72.63	$68.57	+ 5.9
Revenue per Kilowatthour	2.64¢	2.69¢	− 1.9

* By Courtesy of the Federal Power Commission.

THE EDISON ELECTRIC INSTITUTE BULLETIN is published monthly by the Edison Electric Institute, an association of electric light and power companies in the United States and its territorial possessions. Its affiliate members consist of members of the Canadian Electrical Association.

The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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Closing date for the BULLETIN is the tenth of the month preceding the month of issue.

Manuscripts and correspondence relating to the BULLETIN should be addressed to the Editor, Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y.

The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the BULLETIN.

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Subscription price of the BULLETIN is $2.00 per year in the United States; $3.00 per year in foreign countries.

Entered as second-class matter, August 17, 1933, at the post office at Philadelphia 2, Pa., under the act of March 3, 1879. Publication office, 56th and Chestnut Sts., Philadelphia 39, Pa. Editorial office, 420 Lexington Ave., New York 17, N. Y. Volume 24, No. 3, 1956.

The EDISON ELECTRIC INSTITUTE BULLETIN

March, 1956

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CONVENTIONS AND MEETINGS

1956

APRIL

3 ECAP Copy Group Meeting, New York, N. Y.

4- 5 16th Annual Young Men's Utility Conference, Hotel Van Orman, Fort Wayne, Ind.

6 Maryland Utilities Association Annual Business Conference, Lord Baltimore Hotel, Baltimore, Md.

11-13 Northwest Electric Light and Power Association, Engineering and Operating Section, Hotel Vancouver, Vancouver, B. C.

16 EEI Advisory and Executive Committees, Hotel Commodore, New York, N. Y.

16-18 EEI-AGA National Conference of Electric and Gas Utility Accountants, Hotels Commodore and Biltmore, New York, N. Y.

16-18 AIEE Great Lakes District Meeting, Van Orman Hotel, Fort Wayne, Ind.

17 ECAP Management Group Meeting, New York, N. Y.

18-19 Pacific Coast Electrical Association, Administrative Services Section, Huntington Sheraton Hotel, Pasadena, Calif.

18-20 Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.

19 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.

26-27 SAM-ASME 11th Annual Management Engineering Conference, Hotel Statler, New York, N. Y.

29-May 1
Rocky Mountain Electrical League Annual Convention, Broadmoor Hotel, Shirley-Savoy Hotel, Denver, Colo.

30-May 2
EEI Engineering Committees, Edgewater Beach Hotel, Chicago, Ill.

30- 1 Electrical Equipment and Meter and Service

30- 2 Prime Movers

1- 2 Transmission and Distribution and Hydraulic

MAY

2- 4 EEI Accident Prevention Committee, Coronado Hotel, St. Louis, Mo.

4 NARUC Executive Committee, Leamington Hotel, Minneapolis, Minn.

7- 8 PEA System Planning Committee, Hotel Alexander, Hagerstown, Md.

7- 9 EEI Purchasing and Stores Committee Annual Meeting, Sheraton Plaza Hotel, Boston, Mass.

7- 9 Air Conditioning and Refrigeration Institute Annual Meeting, Homestead, Hot Springs, Va.

8 EEI Commercial Electric Cooking Conference, Sheraton Hotel, Chicago, Ill.

10-11 PEA Transmission and Distribution Committee, Skytop Lodge, Skytop, Pa.

10-11 PUAA Annual Convention, Philadelphia, Pa.

14-16 Pacific Coast Electrical Association Annual Convention, Las Vegas, Nev.

17 EEI Industrial Relations Committee, Willis E. Hughes Memorial, Rochester, N. Y.

17-18 PEA Electrical Equipment Committee and Relay Committee, Hotel Wm. Penn, Pittsburgh, Pa.

21 EEI-AGA Orientation Meeting, Headquarters, New York, N. Y.

21-22 PEA Annual Accounting Conference, Warwick Hotel, Philadelphia, Pa.

1956

21-23 Northwest Electric Light and Power Association, Business Development and Personnel Section Meeting, Benjamin Franklin Hotel, Seattle, Wash.

28-29 Arkansas Power & Light Co. Dealer Coordination Committee Southeastern Area Workshop, Arlington Hotel, Hot Springs, Ark.

JUNE

4- 6 24TH ANNUAL EEI CONVENTION, ATLANTIC CITY, N. J.

10-14 National Association of Electrical Distributors, Ambassador, Chelsea and Ritz Hotels, Atlantic City, N. J.

17-21 ASME Semi-Annual Meeting, Statler Hotel, Cleveland, Ohio

17-22 59th Annual Meeting American Society Testing Materials and 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

18-20 American Society Heating and Air-Conditioning Engineers, Semi-Annual Meeting, Washington, D. C.

18-20 Canadian Electrical Association Annual Convention, Manoir Richelieu, Murray Bay, P. Q.

21-23 Northwest Electric Light and Power Association, Accounting and Business Practice Section, Multnomah Hotel, Portland, Ore.

22 Public Utilities Association of the Virginias Accident Prevention Conference, Hotel Roanoke, Roanoke, Va.

24-26 Wisconsin Utilities Association Accounting Section Convention, Schwartz Hotel, Elkhart Lake, Wis.

24-27 Michigan Electric Association Annual Convention, Grand Hotel, Mackinac Island, Mich.

25-29 American Society for Engineering Education Annual Meeting, Iowa State College, Ames, Iowa

25-29 AIEE, Summer and Pacific General Meetings, San Francisco, Calif.

JULY

16-21 International Organization for Standardization Council Meeting, Geneva, Switzerland

24-27 NARUC Annual Convention, Sheraton Palace, San Francisco, Calif.

SEPTEMBER

13-14 EEI-AGA Organization Meeting, Edgewater Beach Hotel, Chicago, Ill.

14-15—Public Utilities Association of the Virginias 38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

17-19 EEI Industrial Relations Annual Round Table Conference, Drake Hotel, Chicago, Ill.

17-21 IES National Technical Conference, Hotel Statler, Boston, Mass.

24-26 EEI Meter & Service Committee, Purdue University, Lafayette, Ind.

26-28 PIP Workshop Conference, Blackstone Hotel, Chicago, Ill.

OCTOBER

1- 3 EEI Prime Movers Committee, Hotel Madison, Minneapolis, Minn.

15-16 EEI Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio

18-19 EEI Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y.

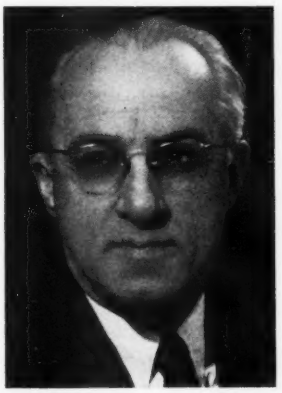
24th Annual EEI Convention Expected to Draw Largest Attendance in History

THE 24th Annual Convention of the Institute, to be held at Atlantic City June 4-6, is expected to draw the largest attendance of any Convention in the Institute's history.

The Convention, on which preliminary work was begun early last Fall by the Program Committee, will have as its theme "Tell Our Story—Go Forward! Clearing and Widening the Expressways of Electric Power! For America!". In keeping with the theme, the addresses to be made at the five general sessions promise to be of exceptional quality and usefulness.

Program Committee

N. Bernard Gussett, President of Iowa Power and Light Co., is Chairman of the Program Committee. Working with Mr. Gussett to assure a program of the highest calibre in timeliness and meaning for the industry are the following members of the Program Committee: J. E. Corette, President and General Manager, The Montana Power Co.; C. B. Delafield, Vice President, Consolidated Edison Co. of New York, Inc.; R. S. Nelson, President, Gulf States Utilities Co.; and Harold Turner, Executive Vice President in Charge of Operations, American Gas and Electric Co.



N. Bernard Gussett
Chairman of the Convention Program Committee

President's Comment

In commenting on the Convention plans, Harllee Branch, Jr., President of the Institute, said recently:

"Challenges are not new to the electric light and power industry. Since its beginning it has been in the vanguard of progress, and it has notably demonstrated that it will never accept the status quo as a guide to its future. We are vitally concerned with the solving of new complexities, in blazing new trails, and in providing extra vigor for carrying the increasing responsibilities for supplying the Nation's electric power. And not least, we are concerned with the preservation of private enterprise and our American way of life.

J. E. Corette

C. B. Delafield

R. S. Nelson

Harold Turner

Members of the Convention Program Committee

"In these matters, I believe this year's Convention will have much to offer. Certainly it promises to be one that will add to the electric industry's zest for greater and greater achievement."

The Over-All View

In addition to a program of compelling interest, the Convention affords electric industry leaders their greatest opportunity to assemble with their colleagues to interchange ideas and to mutually assess and plan cooperative action in attacking industry-wide problems. Progress as well as problems are brought into perspective by the over-all view of the industry which the Convention makes possible.

The opening Convention session will be held on Monday afternoon, June 4, at the Atlantic City Convention Hall, which will be the scene of all of the five general sessions. The second and third sessions will be held on Tuesday morning and afternoon respectively, and the fourth and fifth on Wednesday morning and afternoon.

Registration

In order to accommodate delegates who plan to arrive on the weekend, registration will begin on Sunday, June 3. Facilities for registration will be open in the main lobby of the Hotel Traymore from noon to 6 p.m. on Sunday, and from 8:30 a.m. to noon on Monday. From 11 a.m. to 5 p.m. on Monday, June 4, and from 8:30 a.m. to 5 p.m. on Tuesday and Wednesday, registration will be conducted at the main entrance to Convention Hall.

For registration there will be a fee of $15.00, which will cover admission to all business sessions and social functions. Identification for admission to these events will be badges for gentlemen and pins for ladies, both of which are obtainable only upon registration.

Social Events

A series of social events have been included in the Convention schedule to allow delegates to renew old acquaintanceships and to provide an opportunity for informal interchange of views. A reception, the first of these events, is scheduled from 5 p.m. to 7 p.m. on Monday, June 4, at the Chalfonte Hotel.

On Tuesday, a fashion show and program of entertainment for the ladies has been scheduled at the Warner Theatre. This program will be followed by the Ladies Luncheon at noon, which will be held simultaneously at the Shelburne and Claridge Hotels. Tuesday evening has been kept free of convention-scheduled activity.

The final event of the Convention will be on Wednesday evening, following the adjournment of the fifth Convention general session on Wednesday afternoon, when the presentation of the Charles A. Coffin Award will be made at 8:30 p.m. at the Warner Theatre. A special program of entertainment is being arranged through the courtesy of Westinghouse Electric Corp. and will follow the award presentation. Details of the entertainment, which annually features outstanding personalities of the entertainment world, will be announced later.

Hotel, Travel Accommodations

Since a large Convention attendance is anticipated, it is desirable that hotel accommodations be secured as soon as possible.

The official application blank for hotel reservations is obtainable upon request to the Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y. Reservation applications and inquiries concerning housing should be sent direct to A. G. Mingen, Convention Housing Bureau, 16 Central Pier, Atlantic City, N. J.

It will also be advantageous to make railway or plane reservations as early as possible. The Rotary International Convention will be held in Philadelphia from June 3 to June 7, and the conjunction of dates of the two conventions is expected to tax transportation facilities in the convention area beyond normal. By making early reservations it will help transportation companies to prepare for the additional passenger traffic, and will also assure the kind of accommodations desired.

Panoramic View of Atlantic City Beach Front

The Functions of Private Enterprise in Water Resource Development and Conservation

By Harllee Branch, Jr.
President, Edison Electric Institute and
President, Georgia Power Company

An Address before the National Conference on Water Resources Policy, St. Louis, Mo., January 25, 1956

I HAVE been introduced as an officer of the Edison Electric Institute and it would appear appropriate, therefore, that at the very outset I should make it clear that the Edison Electric Institute and its member companies favor the sound economic conservation, development, and utilization of the water resources of the nation in the public interest. It would also be appropriate, I think, that I make it clear at the outset that these companies have a strong interest in area development. Mr. (Leland) Olds and I were chatting just before the program opened about a rather extensive and long-standing program of area development initiated and promoted by my own company, and which I am delighted to know met with his admiration over the years. All these companies are interested in area development because they grow and prosper only with the sound growth and development of the areas they serve and with the building up of the nation as a whole.

Favor Multi-Purpose Development

These companies also recognize that stream control aimed at flood prevention, water supply, reclamation, navigation, and other considerations may involve functions of the Federal government, and they recognize that often, in connection therewith, electric power development is economically feasible and should be undertaken. They favor, and I wish to underscore *favor*, the multi-purpose development of the nation's water resources.

However, the investor-owned electric utilities know that much of river basin development can be accomplished by non-Federal capital, thereby relieving the taxpayers of a heavy burden at a time when the budget for other Federal purposes is still not yet in balance. More importantly, if developments are done with private capital such developments will enlarge rather than diminish Federal, state, and local tax revenues. There has been ample demonstration in my own State of Georgia and elsewhere that the construction and operation of non-Federal projects in a given stream or basin can be adequately coordinated with Federal developments in other parts of the same stream or basin.

Illustration of Coordination

I cite as an illustration of coordination between a government project and a utility company the Clark Hill and Stevens Creek projects on the Savannah River near Augusta, Ga. I also cite the Allatoona project in Georgia and its coordination with downstream plants, on the Coosa System; and the Buford development, now nearing completion—a government development which will be completely coordinated with downstream projects of our own company at Riverview, Langdale, Bartlett's Ferry, and Goat Rock on the Chattahoochee River.

Conservation of Individual Freedom

In the conservation of our national resources, more important to our national well-being than the conservation of any other resource, is the conservation of the freedom of the individual. This conservation requires the preservation of our constitutional system of strong self-reliant local governments and the preservation of the limitations which our wise founding fathers placed upon the functions and exercise of power by the Federal government. Mr. Olds has said that the ultimate objective in all these developments is the improvement of the people who live upon the land and alongside the waters.

I would point out that when water and land are fully under the control of the Federal government, inevitably the national government holds the power to dominate local government and its citizens. The effective self-determination of local government has then become lost and its power to insure the freedom of the individual has been dissipated and enfeebled.

As illustrative of that, I cite the current controversy between the Tennessee Valley Authority and the Mayor of Huntsville, Ala. From its beginning, the Mayor of Huntsville has been one of the most vigorous spokesmen for TVA. However, I read in the paper less than a week ago that the Mayor and his associates are now considerably perturbed. He thinks a flood control program initiated by TVA disregards the interests of Huntsville to such an extent that he and his fellow citizens have been misguided in their endorsement of TVA. He said, in effect, that if it could happen in flood control operations affecting Huntsville, it could happen in any other activity under the jurisdiction of TVA; and so he is asking that the City of Huntsville prepare plans for a plant of its own for power development.

Historical Position

Since the advocates of government power sometimes seek to create the impression that the regulated and taxpaying utilities are interlopers in the field of waterway development, perhaps I should point out that historically the development of hydroelectric power in America has been a function of private enterprise. The

electric industry was created by individuals who were willing to voluntarily risk their money in the hope of reward in what was, at the beginning at least, a doubtful venture. Private enterprise undertook the first river developments in America for hydroelectric power — notwithstanding the Federal government's constitutional powers and obligations respecting waterways were the same then as now. These developments were undertaken first as a private development for hydroelectric power, just as private enterprise some years ago undertook the first development of fuel-burning generating plants, and just as it is now undertaking the development of the first practical atomic energy plants on a full commercial scale.

Correcting Misconceptions

I think some other misconceptions about the place of American business in the field of river development sorely need to be corrected.

The first of these misconceptions is that hydroelectric power development by the investor-owned electric industry is antagonistic to other water uses. This, I humbly submit, is not true. The same benefits of navigation, flood control, irrigation, preservation of municipal water supplies, and so forth can be realized whether the dams are built with *compulsory* tax funds or with the *voluntary* investment of the savings of American citizens. Of course, I am familiar with the claim that Federal developments are constructed and operated as multi-purpose projects, with greater regard for the other water uses.

Claim Without Merit

In many instances, I think this claim is without merit. The Tennessee Valley Authority, for example, is operated primarily as an electric utility system with the same basic concern for hydroelectric developments as any other hydroelectric utility system. And I would point out that during the incumbency of my fellow panelist, Mr. Olds, as Chairman of the Federal Power Commission, my own company offered to build on its own lands, and at its sole expense, at Clark Hill a complete multi-purpose project matching in design and magnitude, and fulfilling every purpose of the project proposed by the Federal government at that location. This request for permission was denied by the Commission.

Scenic Attraction

In my own state a predecessor of the Georgia Power Co. undertook its first large-scale hydroelectric development as far back as 1911. In those days the people who called themselves "conservationists" opposed these developments upon our waterways, and particularly any development which would produce electric power. The cry of the "conservationist" of that day was that such structures would destroy the natural beauty of our North Georgia waterfalls. They were opposed to that development and sought to enjoin the project by litigation and did delay its completion for a considerable time. Today—and the other members of this panel, I believe, have visited the locality and will know whereof I speak—this development forms a chain of lakes which is one of the great public recreational and scenic attractions of the section.

A Natural Resource

Another misconception is that since water is a natural resource it belongs to all of the people and, therefore, only the government should develop its hydroelectric potential. I would remind this audience that the iron and copper deposits, oil reserves, coal formations, forests, and the fertile soil of our nation are so also natural resources, but there aren't many people in America so dedicated to socialism that they would recommend government ownership of all of these natural resources.

Furthermore, while the mining of iron, copper, oil, and coal, and the cutting of our forests for lumber and pulp necessarily depletes our natural resources, no such diminution takes place with respect to water used for hydroelectric generation. Neither the quantity nor the character of our waters is changed in hydroelectric generation.

Only Government "Big" Enough

A third misconception is that only the government is big enough to do the job of hydroelectric development. The facts will bear out the assertion that private enterprise has been willing and able to undertake any hydroelectric project, regardless of size, when economically justified and when needed to fulfill a real requirement for electric power.

Construction Records

The ability and readiness of private enterprise to carry out large-scale development of water resources is shown by the construction records of the electric companies—programs that have kept pace with the growth of the national economy. The investor-owned companies by the end of 1955 had developed 11,000,000 kw of hydroelectric capacity. This figure would have been much larger had it not been for the fact that the Federal government for a long period of years virtually preempted this field and refused to permit the utilities, including my own company, to go forward with construction programs. Following a partial relaxation of this limitation the utilities are now proceeding with the construction of another 984,000 kw of hydroelectric capacity and are actively seeking permits for another 6,500,000 kw.

Present Status

Among utility sponsored river development programs now underway or for which Federal permission is being sought, are the following:

1. The Alabama Power Co.'s further development of the Coosa and Warrior Rivers in Alabama through the construction of four additional dams at an estimated cost in excess of $100,000,000. This is an undertaking made possible, I would remind you, by the action of Democratic Senators Lister Hill and John Sparkman along with their Alabama colleagues in obtaining legislation deauthorizing Federal development because of interminable delays in prosecution of the government plan. This development will be a fully coordinated, multi-purpose project under license of the Federal Power Commission and under the supervision of the Corps of Engineers, and also subject to state regulation.

2. The Idaho Power Co.'s three-dam program on the Snake River at and below the Hells Canyon reach

and other proposals for the development of power and water storage on the Clearwater River, a tributary of the Snake River. This program was referred to by an earlier speaker, and as I recall, he suggested that the proposed three-dam project would provide insufficient flood storage. It is the finding of the Federal Power Commission that the Brownlee Dam alone will provide enough storage to take care of all save the second largest flood of record on the Snake River. The three-dam project will be fully effective for flood control and storage without the vast expense to Federal taxpayers in other regions which would be necessary for government development.

3. The proposal and program of a group of Northwestern utilities to participate with the Federal government in the building of a huge dam on the Columbia River at the John Day site.

4. The Pacific Gas and Electric Co.'s plan for developing the hydroelectric power potential in connection with a large Federal project to divert part of the Trinity River into the Sacramento River primarily for irrigation and water supply purposes.

5. The plan of a group of companies in New York State to further develop the power potential of the Niagara River.

Total Estimated Costs

It is my understanding that the total estimated cost of these five projects alone will be over a billion dollars. These show that private capital is ready and able to undertake large-scale developments in conformity with the plans and interests of Federal, state, and local governments and in a manner which will fully effectuate and fully safeguard all legitimate public interests.

Reverting for a moment to the statement that only government is big enough to do the job of waterway development, the plain fact is that while the government may be big enough to do the job, it simply does not have the continuity of personnel or purpose to undertake public utility responsibility for any large area of the nation. Even when it tries to do so, the results are far from outstanding. The only two sections of the nation which have experienced serious power shortages in recent years are the Tennessee Valley and the Pacific Northwest, where the government has undertaken such utility responsibility.

Industry's Attitude

I said at the outset that the electric utilities are not opposed to the full and comprehensive development of our water resources, even in proper cases by the Federal government. I think a fair example of the industry's attitude is the policy of my own company, the Georgia Power Co. We had an opportunity to explain our policy before the President's Water Resources Policy Commission in 1950, and it was favorably commented upon by members of that Commission. The policy we stated in 1950 continues to be the policy of our company—it has never been changed. Here is our position:

> "We do not oppose these river developments. We have built many of them ourselves, and where we cannot economically justify the building of them we will not take a dog-in-the-manger attitude. They are an asset to the community and to the state. We have cooperated and we will cooperate with such developments as being in the public interest."

Not Idle Words

These were not idle words nor a pious pose. We have matched our declarations of policy with our actions.

Our company has assisted such developments in many ways, including making our own reservoir lands available for acquisition by the government without litigation and without advance deposit, and also making available our own engineering and foundation studies and services. I believe the position of my company is fairly typical of the industry as a whole.

Functions of Private Enterprise

Now as to the functions of private enterprise in water resource development and conservation, I think the following principles should be followed:

1. Investor - owned companies should be given an opportunity to develop hydroelectric projects which they are able and willing to undertake under full and appropriate governmental regulations and licenses to assure the complete protection of every proper public interest. To the extent that private enterprise is permitted to construct such projects, as I have said, the burden on the American taxpayer elsewhere is reduced. Past experience has clearly shown that Federal and non-Federal developments on a given stream can be adequately coordinated, despite claims to the contrary by government-power zealots.

2. In the case of projects in which navigation, flood control, irrigation or other legitimate Federal functions are dominant and in which electric power production is so subordinate that the projects are unsuited for development by investor-owned electric companies, then, of course, governmental development should be undertaken, provided only that it is on the basis of realistic economic justifications. Benefits should be real rather than fancied, and cost calculations should reflect and provide for interest, for amortization, for replacements, for lost taxes, overheads and the like, in the interest of sound bookkeeping.

3. Government power developments should be self-liquidating. Power generated at such projects should be sold at its market value with all proceeds paid into the Federal Treasury and accounted for in the Federal budget.

4. Government power projects should pay taxes or tax equivalents, including local property taxes, income taxes, and all others. In this way unfair competition between government and taxpaying private enterprise would be lessened, the tax burden on electric consumers would be fairly distributed, and the Federal and local treasuries would receive needed revenues.

5. Power from government projects should be sold without preference or discrimination as between the customers of investor-owned utilities and subsidized power groups. After all, there should be no discrimination between American electric consumers merely because of the agency which fills their power requirements. All should be treated as first-class American citizens and discrimination practiced against none.

These principles I have tried to state briefly and simply. They would have the effect, in my opinion, of disestablishing a privileged class which has grown up in America.

Tax Advantage

This privileged class consists of approximately twenty per cent of the American people—a group whose power requirements are supplied by government agencies, by public power districts, by rural electric cooperatives, and by other such organizations which today enjoy partial or total tax exemptions and many other governmental favors.

These citizens pay no Federal income tax as a part of their electric bills and little, if any, local taxes. By contrast, an average of twenty-three cents out of every dollar of revenue collected from the customers of investor-owned electric companies goes to the support of Federal, state, and local governments.

Preference Clause

In addition to the tax advantage, the privileged class enjoys another discrimination, as the previous speaker indicated, being the provision in Federal statutes known as the preference clause. This provision has become, in effect, a virtual monopoly right of the subsidized power groups to purchase underpriced electric energy from Federal developments. The truth of the matter is that the claim of low-priced Federal power generation is a myth. The government has not and cannot generate power cheaper than a business-managed utility. What it has done is simply fail to reflect all the true costs of generating such power.

The power is underpriced because the Federal facilities carry little, if any, burden of taxation and this tax exemption is passed along to the preference customers. Also, the interest charged on the Federal investment frequently does not reflect the true cost of money to the government; and allocations of costs to non-recoverable Federal functions such as navigation and flood control generally have been more than generous.

If power from Federal projects were sold at market value the burden of the Federal expenditures for such projects would be shifted from the shoulders of the taxpayers generally to the consumers of the power. That is where it belongs. Such a sales policy would also minimize the political demands for privilege that arise when power is underpriced for political reasons.

If the true costs of power generated at government plants were included, the price at which such power is sold by the government would generally be equal to or greater than the price at which power is sold by the regulated taxpaying utility companies.

No Conflict or Discrimination

There would then be no conflict or discrimination in the disposition of the power. Cooperatives, municipalities, and power and irrigation districts would lose their clamorous interest in the output of Federal power projects if this artificially created price differential did not exist.

It is only when the Federal government offers power at a price below its true cost that the cost discrimination in Federal power marketing becomes an allurement. Those benefited by these subsidies, of course, will not give them up without a noisy and determined fight, and they may be expected to demand more and more subsidies. That makes an otherwise very simple problem of legislation and administration a very difficult and threatening one. That is why there is a crying need for the American people to awaken to the fact that their form of government has been and still is being altered under the guise of the conservation and development of water resources.

West Virginia Utilities Jointly Sponsor Study of Workers' Commuting Patterns

A STUDY of commuting patterns of industrial workers in a number of West Virginia cities and towns has just been completed under joint sponsorship by the Bureau of Business Research of West Virginia University and the electric utility companies of the state, acting through their regional organization, the Public Utilities Association of the Virginias.

Dr. James H. Thompson, associate professor of economics at WVU, said the study was initiated about two years ago at the suggestion of area development representatives of the electric companies. The purpose was to provide information on the actual size of the area from which a new industrial plant may draw its workers. Chambers of commerce and other local new-industry promotion groups in West Virginia, as well as the utility area development people, had often been confronted with the problem of defining a practical commuting distance for industrial workers when small-town and rural plant sites were being considered as plant locations by manufacturers.

A new industry locating in West Virginia can expect to draw about 85 per cent of its working force from an area ranging up to 30 miles from its plant, according to a report of the study titled "Labor Market Areas For Manufacturing Plants In West Virginia." Dr. Thompson said more than 5,000 employees at 24 manufacturing plants in the state were surveyed during his study. Nine plants were at Huntington, six at Morgantown, and four at Martinsburg. The remainder were in rural locations.

Dr. Thompson found that commuting distances are considerably larger in the small-town or rural factories. The average commuting distances at two rurally-located chemical plants in the Ohio Valley were 16 and 18 miles, compared with an average of five miles for all 24 firms studied. At the larger of the two plants, 30 per cent of the hourly employees were 20-mile commuters while at the other, not a single employee lived within five miles of the plant site.

Members of the PUAV Area Development Committee, which worked with Dr. Thompson in developing the study, are: H. D. Stillman and D. M. Miller, of Appalachian Electric Power Co.; W. C. Handlan and G. W. Buzzerd, of Monongahela Power Co.; B. G. Atwood, of Potomac Edison Co.; J. R. Perrow and R. N. Fricke, of Virginia Electric and Power Co.; and G. F. Morgan and W. J. Stewart, of Wheeling Electric Co.

EEI Reports on Progress Towards Use of Nuclear Energy as a Power Source

SOUND and impressive progress towards use of nuclear energy as a power source has been made by the investor-owned electric companies in the 20 months since the passage of the 1954 Atomic Energy Act, the Edison Electric Institute recently reported through its Committee on Atomic Power.

Testifying in Washington on March 6, 1956, for the Institute before the Joint Committee on Atomic Energy, Elmer Lindseth, President of The Cleveland Electric Illuminating Co., told the Joint Committee that "exploring and improving the use of nuclear energy as a power source has become an integral part of the every day activities of our industry in seeking to lower the cost of power for the continuing benefit of the public." He reported that 44 companies, to date, are participating individually or in groups in the building of seven large and medium reactor plants and two small ones. The seventh, a large plant of perhap 200,000 kw capacity, has just been reported.

In these undertakings, more than 300 million "free enterprise dollars" are already involved in the planning and construction of atomic electric power plants, and attendant research. Total generating capacity for the nine plants is 1,112,500 kw. These demonstration reactor plants are based on the principal designs thus far developed by the AEC.

Ninety-five electric companies in 13 groups are actively engaged in research, planning, or study programs. AEC access permits have been issued to date to 87 electric companies.

Text of Statement

The text of Mr. Lindseth's statement before the Joint Committee follows:

I am appearing today on behalf of the Institute in response to a letter addressed by the Honorable Senator Clinton P. Anderson, Chairman of the Joint Committee, to the President of the Edison Electric Institute. Your invitation for a representative of the Institute to appear before you again is very much appreciated, in view of the vital interest which the Institute, as a body, and its member companies have in these matters.

The member companies of the Edison Electric Institute serve 93 per cent of the electric customers receiving service from the investor-owned electric utility industry, which, in turn, serves approximately 80 per cent of the total number of electric customers in the United States.

Chairman Anderson's letter was referred to the Committee on Atomic Power of the Edison Electric Institute, which comprises 13 member company executives, and this statement has been authorized by that committee. The names and business affiliations of the members of the committee are appended to this statement.

Part of Every Day Activities

Exploring and improving the use of nuclear energy as a power source has become an integral part of the every day activities of our industry in seeking to lower the cost of power for the continuing benefit of the public. Our industry has a long record of reducing the cost to the public of its service through development of new methods and processes and improved efficiency of operations. We seek every possible means of continuing this long-term trend for the benefit of our customers.

A fundamental belief of the members of the Institute's Committee on Atomic Power is that in order that America may derive maximum benefit from the commercial application of atomic power to electricity production, the development of this important energy source must have the active support and leadership of competitive enterprise. Our entire approach to the challenge and opportunities offered through atomic energy is based upon this fundamental belief.

Objective Interest Indicated

That our industry has an objective interest in the utilization of atomic energy is indicated in part by the fact that each year since 1953, the investor-owned electric utility companies, as represented by the Edison Electric Institute, have submitted to the Joint Committee either testimony, specific recommendations, or statements of views, all looking to means for encouraging wider industrial participation in the development of the peaceful atom. Representations also have been made to the Joint Committee by a number of the leaders of our industry, these, of course, dealing with more specific situations. Important as such presentations may have been, they represent a relatively small part of our industry's over-all contribution in this field.

Present Investment

Although the revisions in the Atomic Energy Act permitting industry participation in the atomic energy program fell short of our previous recommendations to the Joint Committee, nevertheless, today, just 20 months after passage of the 1954 Act, more than 300 million free enterprise dollars are involved in the planning and construction of atomic electric power plants and attendant research. The Duquesne Light Co. is participating with the Atomic Energy Commission in the construction of a commercial atomic power plant. Plans have been announced for the building of seven additional large, medium, and small-size reactor plants by investor-owned companies based on reactor designs thus far developed by the Atomic Energy Commission. The announcement of the sixth and seventh plants has just been made. Still another company, the Southern California Edison Co., is participating with the Atomic Energy Commission in building a ninth atomic power plant. As other promising reactor designs are developed, it is expected that our industry again will be ready to take major responsibility for their commercial development with private capital. A total of 44 investor-owned companies are singly or in groups participating in building these reactor plants (See Exhibit I).

As further indication of the scope of interested and activity in atomic power generation among investor-owned companies, a total of 87 companies today have access permits and 95 companies are participating in 13 or-

ganized research and study groups (See Exhibits II and III). Altogether, eliminating overlapping, there are 104 utility companies actively participating in the atomic field.

Smaller Plants Important

The investor-owned electric industry also has been aware of the importance of developing nuclear power plants of the smaller sizes. As an indication of the forward-looking attitude we have taken in considering this part of the atomic power program, we quote from a report of the Edison Electric Institute Committee on Atomic Power dated December 14, 1955:

"Present indications are that the economics of power reactors of the 5,000 to 40,000 kilowatt size may for some time be adverse in virtually every section of this country. As the art advances, however, the economics of reactors in this size range undoubtedly will improve. With this prospect in mind, we urge that our industry, particularly the smaller utility companies, perhaps by group action, actively study the possibilities of undertaking the building of small reactors as part of this program. This will not only give the smaller groups an opportunity to participate in developing reactor units of a size in line with their possible use, but it should lessen the inequitable effect of the preference clause (Section 44 Atomic Energy Act of 1954) by assuring that private capital to the fullest possible extent is cooperating in the development of each promising reactor design, whether large or small."

Plans of an investor-owned utility, the Pacific Gas and Electric Co., participating with General Electric Co., to build a 5,000 kw atomic power plant have already been reported.

Controlled Thermonuclear Fusion

It is significant that this same report of our committee dated December 14, 1955, looked ahead, too, to controlled thermonuclear fusion as a prospective source of heat for electric power generation:

"... Even though the commercial use of this heat source may be down the road, our industry cannot afford, in the discharge of its duties and responsibilities to its respective areas, to its consumers, and to its investors, to stand by without thoroughly exploring the entire subject. This should contemplate studying the basic problems, the research and developmental work under way, and the effect of that both on current technologies of generating power and on the technology of nuclear fission power just on the threshold of development. It cannot afford to overlook any of these opportunities in view of the tremendous investment represented by its present plant and facilities, in view of the sizable investment already committed to the development of power by nuclear fission and the further commitments to the development of that art that will undoubtedly be made in the coming years. If the industry is to judge wisely and soundly in all these matters, it is important that it have the maximum opportunity to look beyond the present atomic projects; that it be able to look just as far as human thought presently can visualize new methods and procedures for the generation of energy.

EXHIBIT I—NUCLEAR POWER PLANTS

Investor-Owned Utilities Participation

Organization	Reactor Type	Capacity Kw	Estimated Investment By Organization (Millions)	In Operation By
Duquesne Light Co.	Pressurized Water	100,000[1]	15	1957
Consolidated Edison Co. of New York, Inc.	Pressurized Water	236,000[2]	55	1959 or 1960
Nuclear Power Group (7 Utility Companies)	Boiling Water	180,000	45	1960
Pennsylvania Power & Light Co.	Homogeneous	150,000[3]	Not Stated	1962
Power Reactor Development Co. (18 Utility Companies)	Fast Breeder	100,000	55	1960
Yankee Atomic Electric Co. (12 Utility Companies)	Pressurized Water	134,000	33.4	1959 or 1960
Florida Group (3 Utility Companies)	Not Stated	200,000[4]	50[4]	Not Stated
Pacific Gas and Electric Co.	Boiling Water	5,000	1.5[4]	1957
Southern California Edison Co.	Sodium Graphite	7,500[4]	1	1956
		1,112,500	305.2[5]	

[1] 60,000 kw initially.
[2] Oil Fired Superheater to contribute 96,000 kw of the 236,000 kw.
[3] Minimum.
[4] Preliminary Estimate as Reported.
[5] Included in this figure are an estimate for the Pennsylvania Power & Light Co. Plant based on an average cost and 11.8 million research costs by Atomic Power Development Associates, Inc.

NUCLEAR POWER GROUP

American Gas and Electric Service Corp.
Commonwealth Edison Co.
Central Illinois Light Co.
Illinois Power Co.
Kansas City Power & Light Co.
Pacific Gas and Electric Co.
Union Electric Co. of Missouri

YANKEE ATOMIC ELECTRIC CO.

Boston Edison Co.
Cambridge Electric Light Co.
Central Maine Power Co.
Central Vermont Public Service Corp.
Connecticut Light & Power Co.
Connecticut Power Co.
Hartford Electric Light Co.
Montaup Electric Co.
New Bedford Gas & Edison Light Co.
New England Power Co.
Public Service Co. of New Hampshire
Western Massachusetts Electric Co.

POWER REACTOR DEVELOPMENT CO.

Alabama Power Co.
Central Hudson Gas & Electric Corp.
Cincinnati Gas & Electric Co.
Columbus and Southern Ohio Electric Co.
Consumers Power Co.
Delaware Power & Light Co.
Detroit Edison Co.
Georgia Power Co.
Gulf Power Co.
Iowa-Illinois Gas and Electric Co.
Long Island Lighting Co.
Mississippi Power Co.
Philadelphia Electric Co.
Potomac Electric Power Co.
Rochester Gas and Electric Corp.
Southern Co., Inc.
Toledo Edison Co.
Wisconsin Electric Power Co.

FLORIDA GROUP

Florida Power Corp.
Florida Power & Light Co.
Tampa Electric Co.

EXHIBIT II—AEC ACCESS PERMITS

Investor-Owned Utilities

Issued through January, 1956

Alabama Power Co.
American Gas and Electric Co.
Arizona Public Service Co.
Atlantic City Electric Co.
Atomic Power Development Associates, Inc.
Baltimore Gas and Electric Co.
Boston Edison Co.
Cambridge Electric Light Co.
Carolina Power & Light Co.
Central Hudson Gas & Electric Corp.
Central Illinois Light Co.
Central Illinois Public Service Co.
Central Power and Light Co.
Central and South West Corp.
Central Vermont Public Service Corp.
Cincinnati Gas & Electric Co.
Cleveland Electric Illuminating Co.
Commonwealth Edison Co.
Community Public Service Co.
Connecticut Power Co.
Connecticut Light & Power Co.
Consolidated Edison Co. of New York, Inc.
Consumers Power Co.
Detroit Edison Co.
Duke Power Co.
Eastern Utilities Associates
Florida Power & Light Co.
Florida Power Corp.
General Public Utilities Corp.
Georgia Power Co.
Gulf Power Co.
Hartford Electric Light Co.
Holyoke Water Power Co.
Idaho Power Co.
Illinois Power Co.
Indianapolis Power & Light Co.
Interstate Power Co.
Iowa Electric Light & Power Co.
Iowa Power & Light Co.
Iowa Public Service Co.
Iowa Southern Utilities Co.
Iowa-Illinois Gas and Electric Co.
Jersey Central Power & Light Co.
Kansas City Power & Light Co.
Kansas Gas and Electric Co.
Kansas Power and Light Co.
Kentucky Utilities Co.
Long Island Lighting Co.
Middle South Utilities, Inc.
Metropolitan Edison Co.
Mississippi Power Co.
Montana Power Co.
New Bedford Gas & Edison Light Co.
New England Electric System
New Jersey Power & Light Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Northern Indiana Public Service Co.
Nuclear Power Group
Otter Tail Power Co.
Pacific Gas and Electric Co.
Pennsylvania Electric Co.
Pennsylvania Power & Light Co.
Philadelphia Electric Co.
Potomac Electric Power Co.
Power Reactor Development Co.
Public Service Co. of Colorado
Public Service Co. of Indiana, Inc.
Public Service Co. of New Hampshire
Public Service Co. of New Mexico
Public Service Co. of Oklahoma
Puget Sound Power & Light Co.
Rochester Gas and Electric Corp.
Southern Services, Inc.
Southwestern Gas and Electric Co.
Tampa Electric Co.
Toledo Edison Co.
Union Electric Co. of Missouri
United Illuminating Co.
Utah Power & Light Co.
Virginia Electric and Power Co.
West Texas Utilities Co.
Western Massachusetts Electric Co.
Wisconsin Electric Power Co.
Wisconsin-Michigan Power Co.
Wisconsin Power & Light Co.
Yankee Atomic Electric Co.

"Accordingly, the committee has in mind considering an approach to the Atomic Energy Commission with a view of arranging for representatives of our industry to thoroughly familiarize themselves with the entire subject of thermonuclear fusion, with its present state, and on a continuing basis as developments evolve."

The recent action of the Atomic Energy Commission in including for the first time in the list of categories of Restricted Data available to access permit holders information related to controlled thermonuclear processes is an important step toward meeting this need. We commend the Commission for taking this important step.

Unaccepted Recommendations

On the other hand, as mentioned above, certain of our previous recommendations regarding revision of the statute were not accepted. One of these had to do with the disposal of by-product energy produced by facilities owned by the United States. As finally passed, the Act contains a preference clause governing the disposal of such electric energy in a discriminatory manner. Based on past experience with the preference clause as enforced through application of other Federal statutes over a long period of years in a manner completely unfair to taxpayers generally and particularly to customers of the investor-owned power industry, the Edison Electric Institute favors amendment of the 1954 Act so as to provide a non-discriminatory means for disposal of electric energy to take the place of that now prescribed by Section 44. The Institute also advocates deletion of the unfair, unjust preference clause relating to license applications, as contained in Section 182(c) of the Act.

In conclusion, the Committee on Atomic Power of the Edison Electric Institute agrees wholeheartedly with the fundamental principle expressed by the Panel on the Impact of the Peaceful Uses of Atomic Energy that "private enterprise should carry a substantial part of this research and development program, including especially the construction of full-scale 'demonstration' plants." We commend, too, the principle expressed by this Panel that ". . . atomic power be exploited as a source of electric power at a rate consistent with sound technological, economic, and public policy considerations." The important steps already taken by our industry indicate a clear-cut endorsement of these principles and should provide assurance of its willingness and ability to undertake a major responsibility for the commercial development with private capital of other promising reactor designs that may be found to have real economic promise.

Program of Building

We do not feel that there is any present need for the government to embark on a large scale program of building "demonstration" reactors with taxpayers' funds, particularly in the present state of knowledge of the art.

In our opinion, the present plans for developing various types of reactors should be pursued in an orderly way and additional steps should be taken as fast as the development of the art justifies. This is the businesslike way. In our opinion, the expenditure of additional tremendous sums of money to build reactor capacity in the present state of knowledge of the art would be unwise, particularly in view of the prospect of rapid obsolescence of initial atomic power facilities. The United States, compared with most other large nations, is blessed with rich fossil fuel resources. The efficiency in converting these fuels into electric power has made great strides in the past and continues to be improved. We feel, nevertheless, a strong obligation to our customers to go ahead and develop atomic power plants. At the same time, in doing so, we cannot be unmindful of economic factors.

Individual Companies' Opinions

You have heard testimony from utility executives as to specific features in existing laws and regulations that may be retarding progress. These are matters upon which the companies directly involved can best express opinions. This committee therefore takes no position with respect to such

matters at this time other than as I have discussed in connection with Sections 44 and 182(c). The industry generally feels that the plans of the companies that are proceeding with constructing and operating atomic reactors with aggregate capacity of more than a million kilowatts are sound and presently ample in view of the current knowledge of the art. As additional opportunities or needs develop, it is reasonable to expect that further steps will be taken by industry, with emphasis not merely on quantity of nuclear power capacity, as measured in kilowatts, but on advancing the quality and soundness of nuclear power applications. That is the general way that developments in a new field have always been worked out in this country, and industrial progress under this approach has been outstanding.

Again, we of the Edison Electric Institute, through our Committee on Atomic Power, express our appreciation for the opportunity to appear and present these facts and data.

EXHIBIT III—STUDY, RESEARCH, AND PLANNING GROUPS OF ELECTRIC UTILITY COMPANIES

1. ATOMIC POWER DEVELOPMENT ASSOCIATES

Alabama Power Co.
Atlantic City Electric Co.
Baltimore Gas and Electric Co.
Boston Edison Co.
Central Hudson Gas & Electric Corp.
Cincinnati Gas & Electric Co.
Cleveland Electric Illuminating Co.
Connecticut Light & Power Co.
Consolidated Edison Co. of N. Y., Inc.
Consumers Power Co.
Detroit Edison Co.
General Public Utilities Corp.
Georgia Power Co.
Gulf Power Co.
Hartford Electric Light Co.
Jersey Central Power & Light Co.
Long Island Lighting Co.
Metropolitan Edison Co.
Mississippi Power Co.
New England Electric System
New England Gas & Electric Assn.
New Jersey Power & Light Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Philadelphia Electric Co.
Potomac Electric Power Co.
Public Service Electric and Gas Co.
Rochester Gas and Electric Corp.
Toledo Edison Co.
Wisconsin Electric Power Co.
Wisconsin Power & Light Co.

2. ATOMIC POWER ENGINEERING CORP.

Central Illinois Public Service Corp.
Central Louisiana Electric Co.
Central Power and Light Co.
Central & South West Corp.
Cincinnati Gas & Electric Co.
Interstate Power Co.
Kentucky Utilities Co.
Middlewest Service Corp.
Northern Indiana Public Service Co.
Otter Tail Power Co.
Public Service Co. of Indiana
Public Service Co. of Oklahoma
Southwestern Gas and Electric Co.
West Texas Utilities Co.

3. ATOMIC POWER ASSOCIATES OF IOWA

Interstate Power Co.
Iowa Electric Light & Power Co.
Iowa-Illinois Gas and Electric Co.
Iowa Power and Light Co.
Iowa Public Service Co.
Iowa Southern Utilities Co.
Peoples Gas & Electric Co.
Sac County Electric Co.

4. ATOMIC POWER ASSOCIATES OF KANSAS

Central Kansas Power Co.
Empire District Electric Co.
Kansas City Power & Light Co.
Kansas Gas and Electric Co.
Kansas Power and Light Co.
Western Light & Telephone Co., Inc.

5. INFORMATION EXCHANGE CENTER

Carolina Power & Light Co.
Duke Power Co.
South Carolina Electric & Gas Co.
Virginia Electric and Power Co.

6. FOSTER WHEELER, PIONEER SERVICES AND ENGINEERING, DIAMOND ALKALI

California-Oregon Power Co.
Iowa Electric Light & Power Co.
Iowa Power and Light Co.
Iowa Southern Utilities Co.
Kansas Gas and Electric Co.
Kansas Power and Light Co.
Northern States Power Co.
Oklahoma Gas and Electric Co.
San Diego Gas & Electric Co.
Wisconsin Public Service Co.

7. NUCLEAR POWER GROUP

American Gas and Electric Service Corp.
Central Illinois Light Co.
Commonwealth Edison Co.
Illinois Power Co.
Kansas City Power & Light Co.
Pacific Gas and Electric Co.
Union Electric Co. of Missouri

8. PACIFIC NORTHWEST POWER CO.

Montana Power Co.
Pacific Power & Light Co.
Portland General Electric Co.
Washington Water Power Co.

9. PENNSYLVANIA POWER & LIGHT CO.

10. PUGET SOUND UTILITIES COUNCIL

Puget Sound Power & Light Co.

11. ROCKY MOUNTAIN POWER GROUP

Arizona Public Service Co.
Idaho Power Co.
Public Service Co. of Colorado
Utah Power & Light Co.

12. YANKEE ATOMIC ELECTRIC CO.

Boston Edison Co.
Cambridge Electric Light Co.
Central Maine Power Co.
Central Vermont Public Service Corp.
Connecticut Light & Power Co.
Connecticut Power Co.
Hartford Electric Light Co.
Montaup Electric Co.
New Bedford Gas & Edison Light Co.
New England Power Co.
Public Service Co. of New Hampshire
Western Massachusetts Electric Co.

13. MINNESOTA NUCLEAR OPERATIONS GROUP

Northern States Power Co.

EEI COMMITTEE ON ATOMIC POWER

W. L. Cisler, The Detroit Edison Co., Detroit, Mich.
P. A. Fleger, Duquesne Light Co., Pittsburgh, Pa.
G. M. Gadsby, Utah Power and Light Co., Salt Lake City, Utah
A. S. King, Northern States Power Co., Minneapolis, Minn.
E. L. Lindseth, The Cleveland Electric Illuminating Co., Cleveland, Ohio
J. W. McAfee, Union Electric Co. of Missouri, St. Louis, Mo.
C. B. McManus, The Southern Co., Atlanta, Ga.
I. L. Moore, New England Electric System, Boston, Mass.
R. G. Rincliffe, Philadelphia Electric Co., Philadelphia, Pa.
H. R. Searing, Consolidated Edison Co. of New York, Inc., New York, N. Y.
Philip Sporn, American Gas and Electric Co., New York, N. Y.
N. R. Sutherland, Pacific Gas and Electric Co., San Francisco, Calif.
Chairman, E. H. Dixon, Middle South Utilities, Inc., New York, N. Y.

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420 Lexington Ave.
New York 17, N.Y.

Possibilities of a Combination Solar-Heat Pump Unit

A Report by the Joint AEIC-EEI Heat Pump Committee Based on an Investigation by Dr. G. O. G. Löf, September, 1955

INCREASING interest during the past few years in the use of the heat pump as a year-round space-conditioning device, and the possible use of solar energy for space heating, prompted the Joint AEIC-EEI Heat Pump Committee to initiate an investigation to determine the possibility of combining the two systems. Funds provided by EEI made it possible for the Joint Committee to retain Dr. G. O. G. Löf for the purpose of carrying out an engineering analysis.

Climatalogical Data

In order to determine the amount of solar energy which would be available during the peak winter heating period, with a solar-heat pump system using a roof-mounted solar trap, climatalogical data for Columbus, Ohio, for January, 1953, and January, 1954, were analyzed. The amount of solar energy striking a south-facing solar collector mounted on the optimum angle as previously indicated by the work of Threlkeld and Jordan, was determined.

Fig. 1 shows the daily Btu/sq ft solar availability at the various average daily temperatures for the above periods. These graphs indicate that a wide latitude exists in the amount of solar energy available during a period of one month's duration. During January, 1953, the amount of energy striking an area of one square foot per day (mounted as indicated above) varied as follows: Maximum, 1495 Btu/sq. ft/day; Minimum, 93 Btu; and a Median of 662 Btu. In this period there were ten days with solar energy availability of 500 Btu or less, 11 days with 500 to 1000 Btu, and six days with 1000 to 1500 Btu/sq ft available. (Solar data available for only 27 days.)

January, 1954

For January, 1954, the maximum available energy per sq ft per day was 2299 Btu; the Minimum was 292 Btu and the Median 1041 Btu. During this month there were ten days with solar energy availability of 500 Btu/sq ft/day or less; five days with 500 to 1000 Btu; six days with 1000 to 1500 Btu; and ten days with 1500 to 2340 Btu.

These data indicate that January, 1954, had considerably more solar energy available than January, 1953. The weather records show that in January, 1953, there were not any days when the average daily temperature was freezing or below, while during January, 1954, there were 13 days with the average temperature freezing or below. It is interesting to note that while

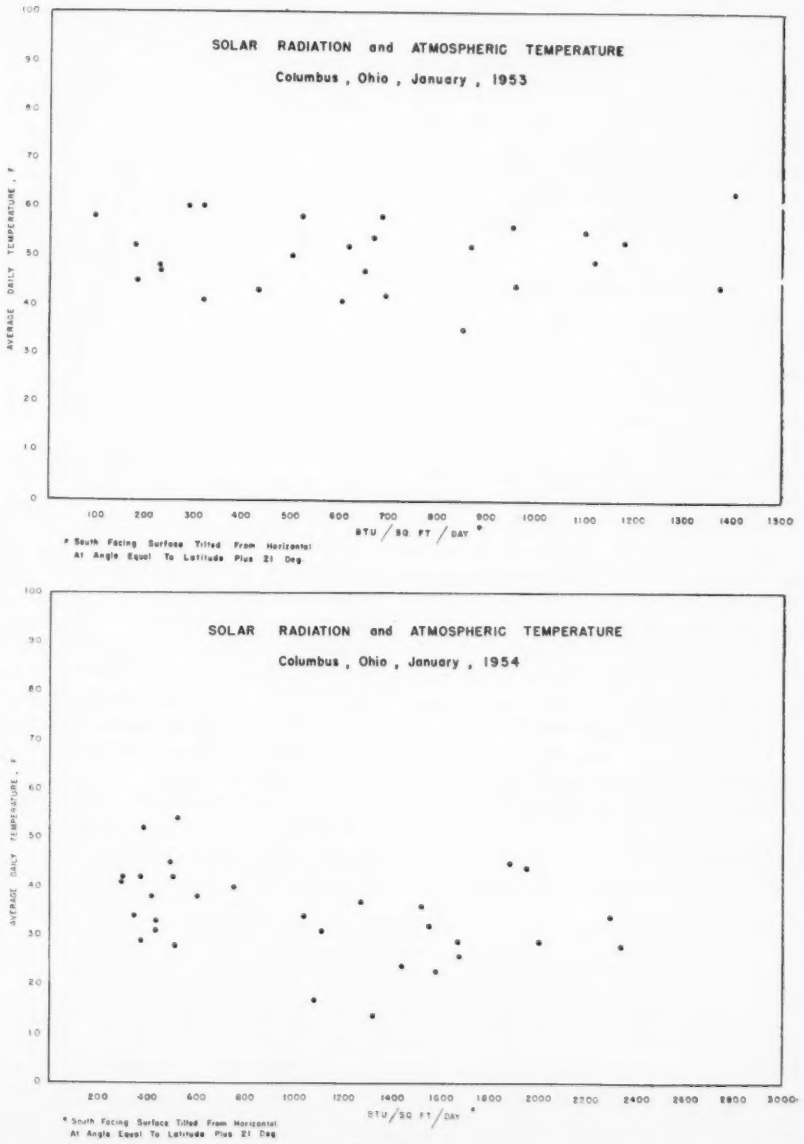
SOLAR RADIATION and ATMOSPHERIC TEMPERATURE
Columbus , Ohio , January , 1953
AVERAGE DAILY TEMPERATURE , F
BTU / SQ. FT / DAY *
* South Facing Surface Tilted From Horizontal At Angle Equal To Latitude Plus 21 Deg.
SOLAR RADIATION and ATMOSPHERIC TEMPERATURE
Columbus , Ohio , January , 1954
AVERAGE DAILY TEMPERATURE , F
BTU / SQ. FT / DAY *
* South Facing Surface Tilted From Horizontal At Angle Equal To Latitude Plus 21 Deg.

Figure 1

the 1954 period had several colder days, it also had a number of days with much higher solar energy availability. Fig. 2 shows the average daily temperatures and the respective solar energy available for the two periods. It may be seen that many of the coldest days also had the greatest amount of available solar energy; however, this is not consistent enough to use as a guide.

The amount of solar energy that would strike solar collectors of 150 sq ft, 300 sq ft, and 500 sq ft during the two January periods above has been determined and is indicated in the table at the bottom of this page.

Dr. G. O. G. Löf, consultant to the Joint Committee on this subject, prepared a preliminary engineering analysis of various proposed combinations of solar collectors of the sizes indicated above, in conjunction with heat storage systems and a heat pump unit. A primary objective of this study was to eliminate the obviously unattractive systems from additional study and determine a probable combination system which might be more completely analyzed.

Report Summarized

The following summary is based on Dr. Löf's report to the Joint Committee dated April 22, 1955:

(1) Columbus, Ohio, was selected as the most logical location for the study.

(2) In order to have a truer picture of annual heating and cooling requirements, an assumed house with a heating requirement of 40,000 Btu/hr at a design temperature of 0 F and a cooling requirement of 37,700 Btu/hr at an inside design temperature of 80 F was selected.

(3) It was apparent from initial phases of the study that it would be necessary to store the day-time solar energy for night-time use in order to have a practical installation. Water was selected as the storage medium in order to simplify the preliminary calculations. This does not mean that other media could not be used or that others should not be investigated.

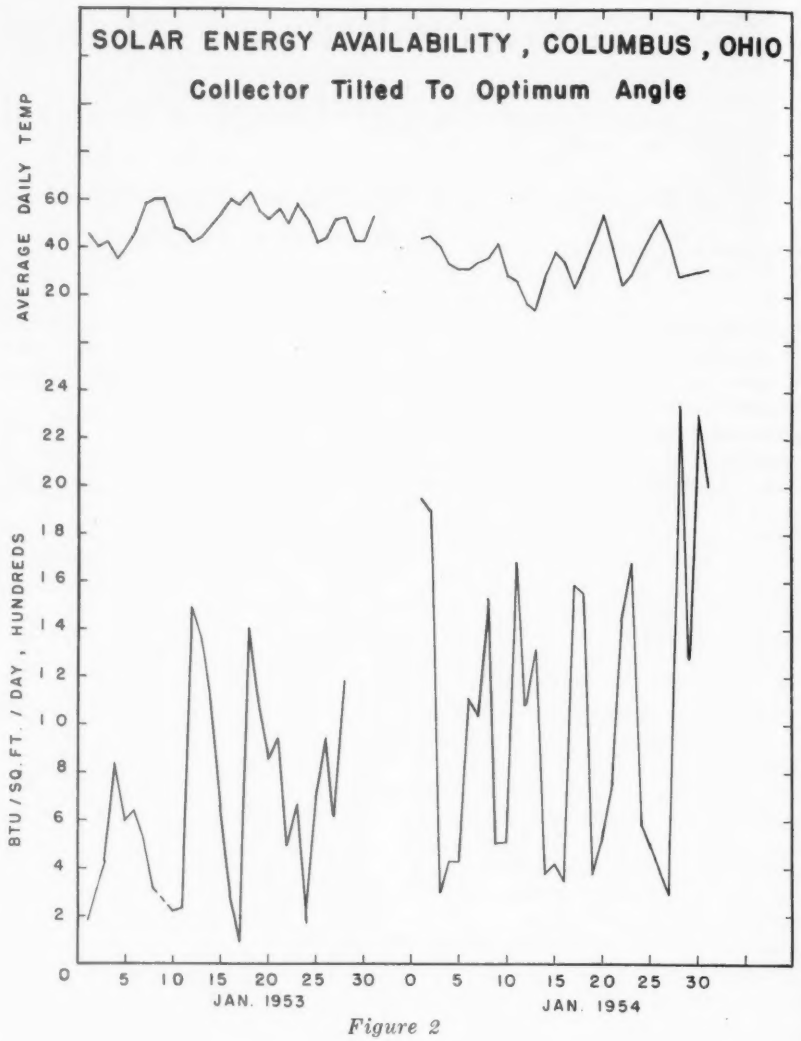

Figure 2

(4) The general arrangement of the components for the solar-heat pump combination system used in this study are shown on Fig. 3. A water-heater type of flat-plate solar collector provided with a one-layer glass cover is assumed to be mounted on a roof sloping 40 degrees from the horizontal facing south. In addition to a conventional heat pump with atmospheric air as a heat source, three combination systems with solar collector areas of 150 sq ft, 300 sq ft, and 500 sq ft were studied for performance comparison. Preliminary studies had indicated that the ideal collector would probably have an area within this range.

(5) Early studies indicated that sufficient storage to cover a prolonged period of cloudy weather would be prohibitive. For the purposes of this study, 472 gallons of water were used as the storage medium for the 150 sq ft collector, 942 gallons with the 300 sq ft collector, and 1570 gallons for the 500 sq ft collector.

(6) Fig. 4 illustrates schematically some of the possible solar-heat pump combinations studied in the preliminary stages of the investigation. The problem of a combination system can be approached in two ways; first, solar energy can be used directly as an auxiliary heat source for space heating and thus decrease the heating load on the heat pump unit (Systems A, B,

	Actual Solar Energy Available, Btu Per Day					
	January, 1953			January, 1954		
Collector Size	Maximum	Minimum	Median	Maximum	Minimum	Median
150 sq ft	224,250	13,950	99,300	344,850	43,800	156,150
300 sq ft	448,500	27,900	198,600	689,700	87,600	312,300
500 sq ft	747,500	46,500	331,000	1,149,500	146,000	520,500

and C on Fig. 4); secondly, it may be used with a collector and storage medium to supply energy to the heat pump (Systems D and E). The storage medium for the latter two systems can be used as a heat source on the evaporator side of the heat pump system as in System D, or as an auxiliary heat source on the condenser, or heat distribution side, of the heat pump cycle as in System E. In other words the solar energy may be used on the "high side" (hot) or the "low side" (cold) of the heat pump cycle. The "high side" requires temperature collection in the neighborhood of 110-120 F for direct use in heating the space, while the "low side" may use temperatures of the order 40-60 F to give a constant heat source for the heat pump. Preliminary study indicated that System D in Fig. 4 would probably have the characteristics best suited for use with a heat pump and this arrangement was selected by the Joint Committee for more comprehensive investigation.

(7) The results indicating operating characteristics of a heat pump operating alone as compared with a heat pump combined with solar collectors of 150 sq ft, 300 sq ft, and 500 sq ft have been condensed and are shown in Tables I and II. For each of the above four system arrangements the total system kwhr use, performance factors, and load factors are shown to indicate the effect of a solar collector on the over-all performance. Each of these factors is discussed below:

(a) SYSTEM KWHR USE—As shown on Table II the air source heat pump, when operating alone, used 7318 kwhr during the heating season. If the 150 sq ft solar collector and associated storage medium were included in the system the power consumption would have been 5736 kwhr, a decrease of 22 per cent. Use of the 300 sq ft collector and its storage medium would decrease the power consumption 38 per cent, and the 500 sq ft collector would decrease the power consumption 51 per cent.

(b) PERFORMANCE FACTOR —The Coefficient of Performance and Performance Factor are useful guides in judging the operation of a heat pump system. The following definitions have been adopted by the Joint AEIC-EEI Heat Pump Committee:

"The coefficient of performance shall be the total useful heating effect produced by the heat pump sys-

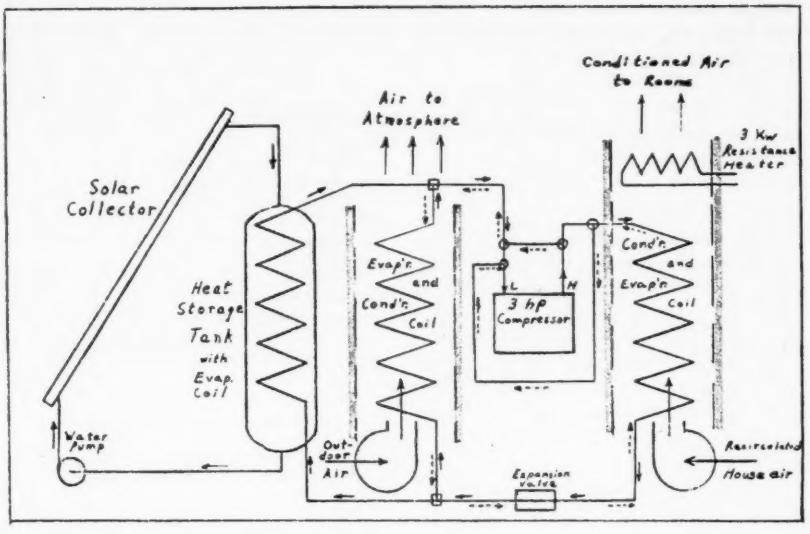

Figure 3

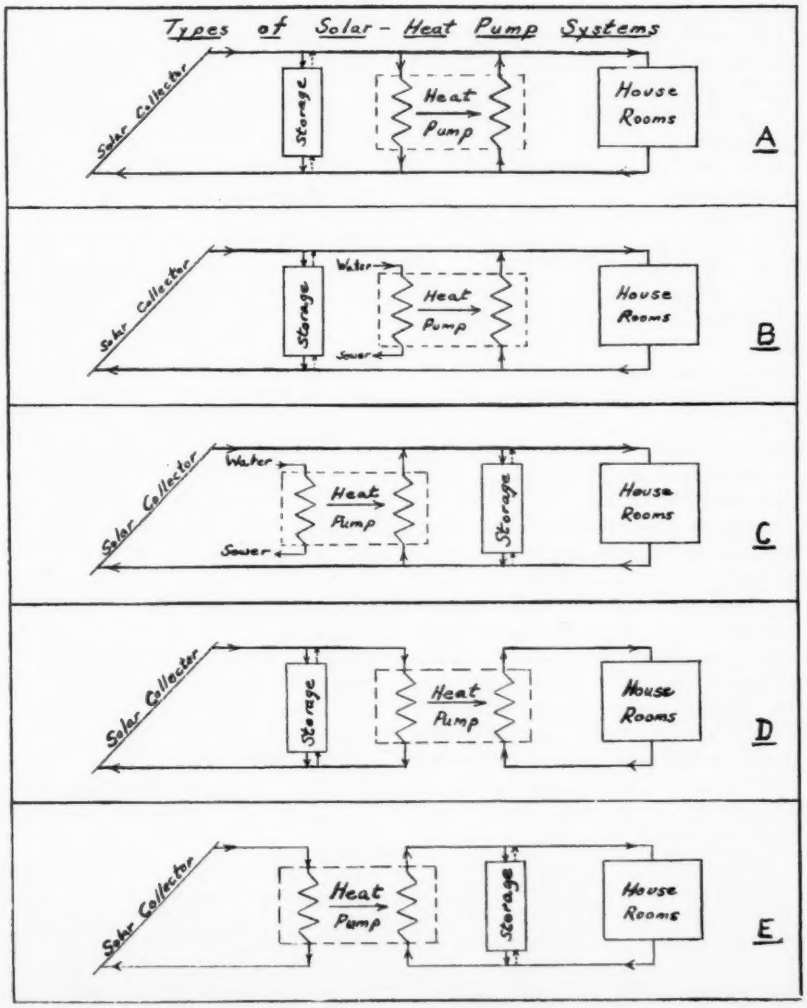

Figure 4

tem at stated conditions, divided by the heat equivalent of the total energy input to the system."

"The PERFORMANCE FACTOR shall be used when referring to a value based on an extended period of time, during which the heat pump system is in active use, stating the period of time covered."

The analysis given by Table II indicates the heat pump unit alone had a performance factor of 2.97 during the heating season. When the 150 sq ft collector is added to the system the over-all performance factor becomes 3.80, an increase of 28 per cent. The performance factor is proportionately better when the 300 sq ft collector is used, with an increase over the basic system of 62 per cent. The 500 sq ft collector would result in an over-all performance factor of 6.10, an increase of 105 per cent over that existing when the air source heat pump is used alone.

From this comparison it is apparent that the performance (efficiency of a heat pump system, operating on the heating cycle, is materially improved as the size of solar collector and storage medium is increased.

(c) LOAD FACTOR—The annual load factor for the air source heat pump was 24.3 per cent when operating alone. The addition of the solar collectors with their relative increase in performance factor did cause a decrease in the annual load factors. The addition of the 150 sq ft collector caused the load factor to decrease to 20.2 per cent; the 300 sq ft collector caused the annual load factor to decrease to 17.3 per cent; and the 500 sq ft collector caused this factor to decrease to 14.8 per cent. This decrease in load factor, as the size of the solar collector increases, is caused by assuming the same size compressor in the heat pump system for all four design arrangements. With such operation the maximum demand remained constant but the improved performance factor due to the increase in size of solar collectors caused a shorter operating period and thus a lower power consumption. It is to be noted that the demand of the 3-kw resistance heater listed in Tables I and II was not included in the over-all system demand because it is only used a relatively short period of time. If

(Continued on page 95)

TABLE I—PERFORMANCE CHARACTERISTICS

	Air Source Only		Air, Storage & 150 Sq Ft Solar		Air, Storage & 300 Sq Ft Solar		Air, Storage & 500 Sq Ft Solar	
	Max Kw	Kwhr	Max Kw	Kwhr	Max Kw	Kwhr	Max Kw	Kwhr
WINTER								
Heat Pump Motor	3.84	5770	3.84	4630	3.84	3710	3.84	2940
Indoor Fan	0.32	535	0.32	431	0.32	373	0.32	295
Outdoor Fan	0.59	986	0.59	523	0.59	249	0.49	76
Solar Collector Pump	...	...	0.08	150	0.10	184	0.15	254
Resistance Heater	(3.00)	27	(3.00)	2	(3.00)	16	(3.00)	...
Total Winter	4.75	7318	4.83	5736	4.85	4532	4.90	3565
System Performance Factor	2.97		3.80		4.80		6.10	
Load Factor, %	23.5%		18.1%		14.3%		11.1%	
SUMMER								
Heat Pump Motor	3.84	2240						
Indoor Fan	0.32	197						
Outdoor Fan	0.59	364						
Solar Collector Pump	...	...	Air only used for Summer cooling cycle. Solar collector & storage medium not used in this cycle.					
Total Summer	4.75	2801						
System Performance Factor	1.97							
Load Factor, %	26.7%							
ANNUAL								
Heat Pump Motor	3.84	8010	3.84	6870	3.84	4950	3.84	5180
Indoor Fan	0.32	732	0.32	628	0.32	570	0.32	492
Outdoor Fan	0.59	1350	0.59	887	0.59	613	0.59	440
Solar Collector Pump	...	...	0.08	150	0.10	184	0.15	254
Resistance Heater	(3.00)	27	(3.00)	2	(3.00)	16	(3.00)	...
Total Annual	4.75	10119	4.83	8537	4.85	7333	4.90	6366
System Performance Factor	2.70		3.20		3.72		4.29	
Load Factor, %	24.3%		20.2%		17.3%		14.8%	

NOTES: Summer performance factor based on cooling effect.
Annual performance factors are weighted averages.
Compressor speed 755 rpm.

The 3-kw resistance heater was included in the basic system to supplement the heat pump at design conditions which enabled the use of a 3-horsepower compressor unit rather than a larger heat pump to handle the heating load at lower outdoor temperatures. Actually, the resistance heater was needed a very small period of time, consequently the demand has not been included in the over-all system demand; however, the kwhr use has been included in the the total consumption data and in the determination of system load factors.

TABLE II—PERFORMANCE CHARACTERISTICS

	Air Source Only	Air, Storage & 150 Sq Ft Solar	Air, Storage & 300 Sq Ft Solar	Air, Storage & 500 Sq Ft Solar
SYSTEM KWHR USE				
Winter	7318*	5736**	4532***	3565
Summer	2801	2801	2801	2801
Annual	10119*	8537**	7333***	6366
SYSTEM PERFORMANCE FACTOR				
Winter	2.97	3.80	4.80	6.10
Summer	1.97	1.97	1.97	1.97
Annual	2.70	3.20	3.72	4.29
SYSTEM LOAD FACTOR, %				
Winter	23.5%	18.1%	14.3%	11.1%
Summer	26.7%	26.7%	26.7%	26.7%
Annual	24.3%	20.2%	17.3%	14.8%

NOTES: *—includes 27 kwhr by 3-kw resistance heater.
**—includes 2 kwhr by 3-kw resistance heater.
***—includes 16 kwhr by 3-kw resistance heater.

Planning, Coordinating Sales Effort Stressed at Industrial Electric Heating Conference

CAREFUL advice on planning and coordinating of sales efforts was provided for 143 representatives of utilities and 64 representatives of equipment manufacturers who attended the second National Industrial Electric Heating Conference held February 6-10 in Cincinnati, Ohio. The conference was sponsored by the Industrial Electrification Council.

Eighty speakers and session chairmen emphasized that there is virtually an unlimited load potential in the industrial electric heating field. During three days of the conference, speakers introduced the conferees to technical principles in such processes as aluminizing, vacuum melting or annealing, and hardening. They also informed the group about specific cases and equipment applications, such as induction melting and surface hardening with electric furnaces and radiant heating with metal sheath electric heaters.

The fifth and final day of the conference was devoted to what was, in a sense, the most important session in that it taught how to sell what had been demonstrated in previous sessions. The talks at this session indicated that electric utilities and equipment manufacturers are making a coordinated assault on the industrial electric heating market.

More Companies Represented

While utility representation increased only slightly in the 1956 conference over that at the 1954 conference, it was significant to note that the number of utility companies represented increased from 57 to 71. The increase in company representation means that information from the conference can be disseminated over a much wider area than that of the previous conference. Manufacturer representation this year was limited to those firms who have membership in the Industrial Electrification Council.

In his talk entitled "Let's Close Ranks and Sell," which was published in the February, 1956, issue of the EEI BULLETIN, W. V. O'Brien, Vice President and General Manager of General Electric Co.'s Apparatus Sales Division, advocated national goals and objectives that would be carried to customers by the local electric utility.

Small Heater Market

Stressing the importance of the small heater market, J. H. Ahrens, Industrial Sales Manager, The Hartford Electric Light Co., expressed the belief that the metal sheath electric heater can acquaint customers with the advantages of electric heat "in a most convincing manner." Customer acceptance after such use can open the door for larger installations of electric heat, Mr. Ahrens stated.

He estimated that 16-million kw of these heaters, representing an annual revenue of about $330 million, are on utility systems today. Mr. Ahrens said that is about 60 per cent of the total load of all types of electric heating equipment.

Heat Pump

Paul O'Neill, of General Electric's Weathertron Division, recommended the heat pump as "the best heating and cooling system for industrial buildings." Mr. O'Neill said: "None of us can or should pass up the opportunity to analyze every new industrial building for the application of the heat pump. The same applies to any industrial plant planning to install only summer cooling. You may find that its heating system is due for replacement and that it is a heat prospect."

The maintenance of constant temperature and an even level of relative humidity which is important in some manufacturing operations is a major selling feature of the heat pump, Mr. O'Neill told the conference. As another selling point, he listed zone control in which one unit can cool one portion of the plant while other units simultaneously heat a different area of the plant.

P. A. Meyer, Vice President, Michigan Oven Co., pointed out that electric heating methods have played and will continue to play a major part in the development of quality products treated in low-temperature industrial ovens. The fuel choice today is between electricity and direct gas, he said.

"The most economical fuel for an oven is seldom selected on a direct cost per Btu basis . . . ," Mr. Meyer stated. "The real comparison is the value of the finished product, considering every single phase of all of the operations involved."

A recent study of heating methods in the final exhaust of television tubes revealed that a strict fuel comparison showed the actual cost would be 2 cents more per tube for electric heat than with gas heat, Mr. Meyer revealed. He said that the tube represents a value of $20 to $25 at the final exhaust stage.

Case Studies Cited

Cited throughout the conference were case studies which showed how electric heating, when sold to an industrial firm which had previously used another fuel, both added to a utility system's load and cut the customer's over-all costs beyond expectations.

One such case was that described by Carl S. Sodergren of Baltimore Gas and Electric Co.'s Industrial Power Department. Two 280-kw electric furnaces were sold by his company as replacements for oil-fired units to a firm which used hot-dip galvanizing. By affecting 10 per cent savings in zinc, and 20 per cent savings in labor, in addition to greatly improved working conditions, Mr. Sodergren said the new units paid for themselves in the first year of operation.

One of several speakers who pointed out the role that electric heat can play in the research and development of new materials was R. R. LaPelle, Manager, Furnace and Close Atmospheric Generator Section, Industrial Heating Division, Westinghouse Electric Corp. Mr. LaPelle told of vacuum annealing techniques that are the

present key to the practical application and usage of titanium.

He pointed out that vacuum annealing furnaces are by necessity electrically heated in most applications although gas firing can be used for smaller units. Mr. LaPelle predicted that great developments in the near future, which will lower the operating costs of such equipment, will be made from the experience now being accumulated in this field. As a result, electric heat could lead to a more widespread civilian and military use of titanium, the high-temperature metal which was produced to meet the stringent requirements for military aircraft.

R. W. Kise, Manager, Marketing Administration, General Electric Co., urged salesmen to provide their customers with "more than the normal curb service" by aiding them in making a thorough cost analysis before deciding on their heating equipment. Such an analysis covers direct labor and supervisory costs, direct and process materials costs, quality and uniformity of product, and product handling, Mr. Kise stated. He reminded his audience that the salesman should also determine whether subsequent operations—such as grinding, machining, or cleaning—could be reduced or eliminated by electric equipment.

A limited number of copies of the conference proceedings, prepared in advance, are available from The Industrial Electrification Council, Room 2650, 420 Lexington Avenue, New York 17, N. Y.

Currently the proceedings contain 57 of the 68 papers presented at the conference. The remaining 11 papers, together with transcripts of the panel discussions on ovens and on heat treating, are being reproduced and will be mailed to purchasers of the proceedings as soon as possible. When completed, the proceedings will contain over 700 pages complete with text, charts, and illustrations. They are bound in an 8½ inch by 11 inch heavy fiber board clasp binder and will be a valuable guide to power salesmen, industrial heating engineers, and others interested in the application of industrial electric heat.

Prices for the proceedings are $10 per copy to companies represented at the conference and $15 per copy to all other companies.

Philip A. Fleger Receives Management Award

PHILIP A. FLEGER, Chairman of the Board and Chief Executive Officer of Duquesne Light Co., was presented an award for "Outstanding Leadership in the Field of Management" by Duquesne University's student chapter of the Society for Advancement of Management at its annual conference and banquet in Pittsburgh, Pa., on February 8, 1956.

The Very Reverend Vernon F. Gallagher, C.S.Sp., President of Duquesne University, made the presentation, and Gwilym A. Price, Chairman and President of Westinghouse Electric Corp., was a featured speaker for the occasion. The theme of the conference —"Atomic Energy and Its Peacetime Industrial Use"—emphasized the important part Pittsburgh and its industries are playing in the development of peacetime use of this energy source.

In his address following the award presentation, Mr. Price said:

"Philip Fleger has personally led his company into a great adventure. He has had the colossal nerve to build the nation's first atomic power plant, virtually on top of a coal mine. But in all this he has acted with a down-to-earth realism and with very practical motives. I give you this statement. 'Up to the present time,' he has said, 'we have been fairly successful in coping with rising costs. But we are beginning to exhaust the principal means we have used to do this. Therefore, if we are to hold down the price of electricity, we must develop new methods, and we think atomic power is the most promising. Since our earnings are regulated, those who stand to benefit most from the development of atomic power are the users of electricity.'"

"Other businessmen have done good service in aiding their city's redevelopment work," Mr. Price stated. "Other utility executives have expanded their system's generating capacity. But there is only one utility executive in the United States who has poured cement and erected steel on a central station that will utilize atomic power. Shippingport is, in short, a striking example of pioneering initiative by a company and of unique personal leadership by its chief officer."

Mr. Price listed some of Mr. Fleger's accomplishments as "substantial evidence of the qualities for which you are honoring Philip Fleger." He spoke of Pittsburgh's outstanding $2½ billion redevelopment program, and cited how Mr. Fleger and others at Duquesne Light Co. had helped. He touched on the company's $300 million modernization and expansion program and its importance to the new Pittsburgh.

Mr. Fleger told the conference, in accepting his award:

"It is now generally accepted that upon its completion Shippingport will become a Mecca for scientists and engineers, and many others throughout the world. Actually, a trek of such people has already begun.

"Naturally we at Duquesne Light are gratified that we are responsible for bringing this epic project to Pittsburgh. Yet we have never had any illusions about its inherent difficulties. On the contrary, we have recognized from the outset that pioneering on this scale is a very trying business.

"Few think it possible to foresee the total, ultimate impact of atomic power. But many think its potentiality for good is so great we cannot afford to speculate about it, or to indulge in half measures. Shippingport is an expression of this viewpoint."

Another conference address was one prepared by Dr. W. Kenneth Davis, Director of the Division of Reactor Development of the Atomic Energy Commission, and read in his absence by Dr. Clark Goodman of the AEC. Dr. Davis warned that the United States is a long way from attaining "economic" nuclear power and stated that the belief that the day of cheap nuclear power is almost here is a "dangerous myth." He said:

"Such a myth is dangerous in our own domestic undertakings and — what is more important—it is dangerous in our international dealings. The United States cannot afford to give her friends a false impression of what nuclear power can do or where the nation stands in that development."

Furnishing Electric Service to Levittown Development

By H. Mac Vaugh

General Superintendent, Suburban Division, Transmission and Distribution Department, Philadelphia Electric Company

Presented at a meeting of the EEI Transmission and Distribution Committee, Philadelphia, Pa., February 7, 1956

IN preparing this paper, the collection and rejection of various bits of material and information needed for a coherent story established two ideas very quickly: first, Levittown is not the whole story, and second, there is a lot to say, but it has to be said tersely and pointedly, or your patience won't last out the story. So I am presenting this account of Levittown as a part, major in scope, but still only a part of the development of an area, and I shall present the design and operating facts somewhat bluntly, but in the interest of pace and brevity.

During the latter part of 1949 and well into 1950, the mixture of rumor and authentic information in circulation regarding "Big Steel's" building of its new plant near Morrisville, Pa., in the Eastern Division of Philadelphia Electric Co., was well nigh overwhelming. Stories, yarns, predictions, were a dime a dozen and highly over-priced. But ultimately, a firm pattern did appear and The United States Steel Co. did start work on what is now its "Fairless Works."

Intention to Build

As a quasi official adjunct to this main project, during 1950 announcement was made of the intention by the Danherst Corp. to build "Fairless Hills," a housing development of the model village type, consisting of approximately 3,000 moderately priced homes, and possibly 150 or 200 more expensive custom built dwellings, as well as a super shopping center, churches, schools, parks, swimming pools, a water plant, and a sewage disposal plant. At this time—1950—this announcement by Danherst was the biggest single housing development ever contemplated within the Philadelphia Electric Co. territorial limits. It was exciting and dramatic, and its size considerable and important. Here it was, a whole town that, within two years, would be built to accommodate more than 10,000 people on land that was being used for truck farming at the moment. The appeal to the imagination was great.

Signs of Progress

Late in the spring of 1951 Danherst actually started to move and very soon signs of progress were apparent. Shortly after this—late in 1951—a real bomb was exploded—Levitt and Sons, Inc. entered the scene with a sudden announcement that work would start immediately on the construction of Levittown, Pa., on some 3,000 acres of land owned by the corporation. This town was announced as an improved version of Levittown, N. Y., and would consist of some 12,000 single homes, basically of four different types, and also including a light industrial area, a shopping center, space for schools and churches, parks, and recreational facilities, wide streets, adequately lighted, and completely landscaped and planted. This was approaching the millennium if credence could be placed in the statement. Very quickly we came to the conclusion that credence could be admitted and these people did mean what they said. Survey parties and construction crews laying out and building streets and house pads were all over the land, and our Sales Department was in constant touch with the Levitt group working out the details, not only for permanent facilities to the town, but also for the considerable blocks of power needed for construction purposes.

On June 20, 1952, Meter #1 was set and by the end of the 1952 program Meter #3277 had been energized. In 1953, 4,321 houses were built; in 1954, 2,840 houses, and in 1955, 3,314 houses. To date the program originally announced has been exceeded by over 15 per cent; additional acreage has been acquired and a program of 3,000 more houses for 1956 approved. While this has been going on "Fairless Hills" has been completed at about 85 per cent of the original announcement and other builders, smaller but quite numerous, have been busy around the edges of these two major operations. By the efforts of these small independents an additional 8,400 homes will have been built by the end of 1956. By this year's end we will have, therefore, in an area of approximately 19 square miles, or 12,000 acres, approximately 28,000 homes, several shopping centers, many churches, many schools, a golf course, numerous parks, many swimming pools, an artificial lake, an industrial reservation, several water pumping and treating plants, several sewage disposal plants, and the largest automatic telephone exchange in the state, none of which existed five years ago, and all of which replaces the approximately 400 farm families occuying and working this land, at that time. This, we feel, is an excellent example of important expansion of major proportions. You probably didn't follow my figures too closely, but no analysis they say that approximately 60 per cent of this expansion is Levittown alone, and from the standpoint of effect on distribution design and area development, Levittown is and was even more important.

1951 and 1952

So far in this discussion I have attempted to give you a background picture of what can happen to a corn field almost overnight, if the right set of influences go to work on it, and be assured it is an astonish-

ing thing to watch, but at this time I should, if this story is to ever end, go back to 1951 and early 1952.

Our position then was this—in an area of less than 6,000 acres, near the center of which existed our Emilie Transmission Substation, two real estate developers were on record as firmly intending to construct for sale, some 15,000 homes, plus all the other load demanding satellites normally servicing the people occupying these homes. Also, we were reasonably sure that other builders would get on the band-wagon and further complicate the situation. Minimum equipment to be installed in these homes was to include an electric range, refrigerator, automatic washer, plus normal lighting, normal small appliances, and more often than not an oil burner. We knew that most would add television and a great many would add electric clothes dryers and air conditioners. Demands per house were estimated generously, we thought, at 1½ kw per home over the peak.

Korea and D.E.P.A.

Remember, also, that at that time we still had the Korean incident with its concomitant D.E.P.A. and difficult material conditions as a major deterrent to free choice decisions. What to do was a many sided question. Copper was short and likely to become shorter. We had been a 4-kv company, but could 12.8 or 13.2 prove in any real economies, and if so, what were the penalties. The answer to the question of a substitute for copper was relatively easy, since the question reduced itself to an acceptance of aluminum, which was plentiful, practically uncontrolled and cheap. So, the decision was made to use aluminum for all aerial conductors, whether substransmission, primary, secondary, or service drops, and aluminum for underground multiple street lighting. We felt also that this project could be used as a proving ground for the development of standards applicable to the rest of the system, and lessons in the use of this material learned here would apply universally throughout the system. Subsequently, this has worked out exactly in that way, so that at the moment we can say that Philadelphia Electric Co. is, in a practical sense, an aluminum aerial conductor company. The only copper use agreed to in the area was that required for (primary) underground cables within shopping centers and needed for primary underground connections between a substation and the aerial circuit to be fed.

Six Considerations

The decision was also made to stay with 4-kv distribution, but this decision was not nearly as easy to make as the conductor decision, and required a base in six considerations before a sound practical conclusion could be reached.

In the first place, a small island of high voltage distribution would be an annoying situation to operate, and not the sort of thing we would normally seek.

Second, the use of high voltage distribution would conflict with established wholesale primary distribution rate schedules.

Third, if it is to show economy, high voltage distribution demands longer, more heavily loaded circuits and fewer substations. The loss, therefore, of any primary circuit designed on this basis would mean the interruption of more customers than we wished to chance.

Fourth, the use of high voltage distribution meant the training and equipment of a hot stick crew, or, if not a hot stick crew then at least the development of new operating methods.

Fifth, any underground construction at these voltages is considerably more expensive than 4-kv underground either to install or operate.

Sixth, Emilie Transmission Substation existed within the area. Seven 33-kv lines from this substation traversed the area in all directions. The extension of four more lines over favorable routes was practical and economical. The establishment of duplex type unit substations at load centers, roughly a mile apart, was feasible and practical, would result in feeder portions of a 4-kv circuit that were short and sturdy and make maximum use of the load carrying ability of the 33-kv circuit.

All of the first five reasons were important, but this sixth reason seemed to be the real clincher, since we thought it would appear almost shameful to ignore such obvious natural and existing advantages to embark on a policy whose results could only be incompletely and quite possibly inaccurately assessed. We therefore stayed with 4-kv.

From a design standpoint this job —Levittown—and its neighbors can be divided into six major categories: the substations; 4-kv distribution; transformers and secondaries; service drops; street lighting; and shopping center service. A short description of each of these six phases is in order.

The Substations

All substations are of the outdoor unit type supplied by aerial 33-kv lines, expandable from a single unit supplied by a single line to a multiple duplex type supplied by two lines. In this way a given substation location may change from a single 1500-kva unit to as many as eight 2500-kva units connected as four duplexes. The 33/4-kv units are equipped with tap changing under load voltage control and an air circuit breaker on the 4-kv side. On a single unit the outgoing circuit leaves the unit underground with single conductor 250-mcm cable. On duplex installations a 4-kv tie breaker is connected by 250-mcm cable underground between two units, fed from different 33-kv lines. These connections are made in the cable compartments of the units and on the load side of the unit breakers. Controls are arranged to close the tie breaker on loss of 33-kv supply and open the tie breaker on the reestablishment of supply. No transfer occurs when a unit breaker operates on overload.

4-Kv Distribution

The next major design problem was 4-kv distribution. The avoidance of street pole lines, preference for rear property construction, and the joint use of poles by ourselves and the Bell Telephone Co. were and are firmly established policies of long standing, that have been universally popular with most builders. Levitt and Sons and Danherst were enthusiastically cooperative in accepting this sort of construction. Arrangements were worked out with the Bell Telephone Co. of Pennsylvania to do the major portion of the polling in this area, installing in general 30-ft Class 4 poles except for those 35's needed at transformer or tight clearance loca-

tions. All circuit mains are made with 4/0 bare aluminum conductors. Spurs and branches are made with either 1/0 or #4 ACSR, depending on loading. Maximum voltage drop was fixed at 3 per cent, although in general, very few circuits will show greater than 2 per cent. No fusing of either mains or branches is used.

Transformers

Three sizes of transformers are used—15, 25 and 37½. Nineteen fifty-two design specified nine customers on a 15; 18 on a 25; and 28 on a 37½. Testing of existing installations has indicated the need for somewhat more transformer capacity and recently design has been based on six customers on a 15; 14 on a 25; and 24 on a 37½. A goodly proportion of the 3,000 home Levitt and Sons program for 1956 specifies complete air conditioning and for these homes, design will be based on eight homes on a 37½-kva.

Secondaries

Secondary circuits are almost universally 1/0 ACSR top rack position installed neutral and 4/0 stranded aluminum polarity conductors. Nineteen fifty-two and 1953 design specified bare neutral and covered polarities. Since 1954 all conductors are bare, with spacers installed on approximate 50-ft centers. Maximum secondary voltage drop has been established at 3 per cent.

Services and Meters

Service extensions to Levitt houses in 1952 and 1953 were made by one continuous piece of SE cable from the closest possible point of secondary attachment to the outdoor socket type meter installation on the house. The builder having installed the normal support and cable grip at the house, Philadelphia Electric Co. assumed the cost of the cable from the house to the secondaries including the secondary end cable grip. Direct support of this cable was taken by the bare neutral.

During 1954, at about the time bare secondaries were established, design changed to the use of triplex aluminum taken off spreaders so that all three secondary wires bore the service. This design is universally established throughout the system at this time.

Street Lighting

The rate for street lighting in the suburban area of Philadelphia Electric Co. only covers aerial supplied installations, mounted on wood poles, served from either series or multiple circuits. It was decided to use multiple circuits throughout both Levittown and Fairless Hills, since both developers wanted underground fed ornamental lighting, and some economy could be shown in favor of multiple, under these conditions. In Levittown, from the transformer pole where a photo electric control is installed, the circuit proceeds in aluminum cable in conduit underground along a side property line to the street curb and then each way by direct burial to the lamp posts. Circuits average about eight lamps. Lamp posts on secondary streets are 20-ft tapered aluminum poles with 4-ft brackets and open luminaires for 1000 and 2500 lumen lamps producing I.E.S. type II light distribution. For boulevards the posts are 25-ft tapered aluminum with 4-ft brackets, and enclosed luminaires using 6000 and 10,000 lumen lamps producing I.E.S. type III light distribution.

Fairless Hills lighting is similar in all respects except that for obvious reasons, steel posts instead of aluminum posts have been used. In both cases a contribution amounting to the difference between the cost of aerial fed wood pole mounted lighting and the cost of underground ornamental lighting was made by the developer, with title vested in Philadelphia Electric Co. Other developers throughout this area have, in general, accepted standard installations, most of which are series fed. In all, some 7,000 street lights have been added in this area during the past five years.

Shopping Centers

There are presently several shopping centers within the area we have been describing, and the biggest and most complete is the Levitt shopping center. Upon ultimate completion it will cover 20 acres of ground, create a demand of some 6500 kw and accommodate 69 customers housed in eight different buildings.

Electric facilities are underground, with the conduit and vault system provided and owned by the developer. All primary cable, sectionalizing switches, control equipment, transformers, and secondaries used to supply customers under secondary voltage rates were installed and are owned by Philadelphia Electric Co. Often larger customers whose requirements exceed 50 kw find it worthwhile to take service under our primary distribution rate, two features of which are customer ownership of transforming equipment, and service at primary voltage.

This shopping center is more complete than any other on the Philadelphia Electric Co. system, and it would be hard to imagine a type of commercial enterprise or needed service not available at this location. As a matter of general interest, I think that the fact that all 22 of the heat pumps in operation on the Philadelphia Electric Co. system are installed here, is an indication of the progressive and enlightened planning and operating policies that have been so important, not only to the success of this shopping center, but to the success of this whole vast program that has effectively produced a city on what was farm land, literally only yesterday.

You may be interested in a few gross figures, based on about four years actual and 1956 estimated experience, that will help you in assessing the magnitude and dramatic scope of this area transition.

Total amount of wire installed	3,000 miles
Total number of transformers installed	2,000 (average 25 kva size)
Total number of poles installed by Bell Telephone Co.	7,000
Total number of poles installed by Philadelphia Electric Co.	3,000
Total number of loop services installed	28,000
Total number of meters installed	35,000
Total number of street lights installed	7,000
Total number of new 4-kv circuits extended	26

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Purchasing and Stores Committee to Meet in Boston

THE ninth annual meeting of the EEI Purchasing and Stores Committee will be held on May 7, 8, and 9, 1956 at the Sheraton Plaza Hotel in Boston, Mass. An interesting program of timely subjects, which should provoke good discussion and prove to be beneficial to the purchasing and stores representatives attending these sessions, has been arranged by the committee.

Following the pattern of previous meetings, the Purchasing and Stores Executive Committee will have a meeting on Sunday afternoon, May 6. Official welcome to the meeting will be made on behalf of Boston Edison Co., the host company, on Monday, May 7, starting at 9:30 a.m. Morning and afternoon sessions will be held on Monday and Tuesday, May 7 and 8, with group luncheons on both days at which brief addresses will be made by officials of Boston Edison Co. and neighboring utilities.

Wednesday, May 9, will be devoted to visitation to the purchasing and stores facilities of the host company. The principal point of interest in this inspection tour will be the new service center of the company in Waltham, Mass.

Programs' Subjects

The subject matter on the Monday and Tuesday programs will include "Departmental Interest and Influence in Purchases" dealing with the several sources from which the Purchasing Department receives requests to buy and the part these sources play in procurement. The question as to the extent to which the interests of other departments, such as engineering, are permitted to take part or influence purchases by direct contact with suppliers will be developed.

The practices relating to routing, expediting, and checking of rates affecting the many commodities, including fuel, handled by utilities and the value of adequate and trained personnel will be developed under the subject of "Traffic Procedures."

A project committee will endeavor, through contacts with the many member utilities, to establish some practical standard which can be used as a guide in determining when and how much to buy.

W. M. HOLLS
Chairman of the Purchasing and Stores Committee

"Developing Fly Ash Outlets" will be presented as a topic in a nontechnical approach to show the various ways of coping with this problem from the purchasing agent's angle. A brief talk on extended lead times for equipment and material for major projects will also be given.

Measuring Methods

For the stores personnel, the importance of the subject of "Methods of Measuring Performance in Stores Operations" has been emphasized by the increased demand for information concerning this subject. A study of the various methods in use in member utilities undertaken annually by a storekeepers' seminar will provide useful information for the development of this report.

By projecting lantern slides on special handling, storing and salvaging equipment, furnished by members of the Purchasing and Stores Committee, together with descriptive matter outlining uses and blueprints, sketches, and diagrams covering details necessary for fabrication, a project on the "Handling and Storing of Problem Material" will be effectively presented.

Under the subject "Accumulation, Handling, Grading, and Sales of Scrap," the various practices in use in the member utilities will be indicated.

The rather broad subject of "Stock Control" will cover both mechanized and manual controls affecting issues, returns, stock replenishments, and maintaining minimum feasible investment in materials and supplies, including controls on the accumulation of inactive and obsolete material.

The subcommittee on Standard Packaging and Nomenclature is studying the possibilities of effecting economies for the manufacturers, as well as consumers, by establishing standards for the packaging of porcelain insulators.

Executive Committee

The members of the Purchasing and Stores Executive Committee are W. M. Holls, Baltimore Gas and Electric Co., Chairman; E. N. Scott, Long Island Lighting Co., Vice Chairman (Purchasing); T. S. Dunstan, Consolidated Edison Co. of New York, Inc., Vice Chairman (Stores); G. H. Cole, Alabama Power Co., Secretary; Past Chairman, C. H. zurNieden, Philadelphia Electric Co., and members-at-large, J. B. Homsher, Gilbert Associates, Inc., G. C. Meetze, South Carolina Electric and Gas Co., H. T. Simpson, Boston Edison Co. and R. C. Wenz, Duquesne Light Co.

For the ladies who may attend the annual meeting, entertainment consisting of a tour of the historic and educational points of interest in and around Boston, together with luncheon, will be arranged on Monday, May 7. Additional tour arrangements will be made for Tuesday, May 8.

Deadline Near For Reddy Kilowatt Annual Report Contest

May 14, 1956, is the deadline for entries in the Reddy Kilowatt Annual Report Contest.

This is the 17th year for this Annual Report Contest—it's the oldest of its kind. Because Annual Reports of utilities have shown such tremendous improvements each year, recognition in this contest is highly prized by utility executives.

Send your entry to:
Reddy Kilowatt, Inc.,
50 Church Street
New York 7, New York

Three Resuscitations Recognized by EEI Awards

THREE more cases in which a successful resuscitation has earned industry-wide recognition in the form of EEI Medals for electric company employees are summarized in the following article. As in former cases, these attest to the bravery and disregard of self by men in their attempts to aid a troubled fellow worker, to the imperative need for cooperation among a crew in time of emergency, and to the ever-present value of dynamic, continual safety training by companies.

As details of resuscitations and awards presentations are received by the Institute, additional cases will be reviewed in the BULLETIN.

HENRY N. JAEGER
QUINN N. FOREHAND
STEVE P. STRAVAKIS
REINHOLD W. SCHULTZ

Florida Power Corporation

A four-man Florida Power Corp. crew was "cribbing" poles on Millenbacher Road near Clearwater, Fla., where a storm sewer was being laid. The work had been in process during the morning of October 6, 1955.

At 3:35 p.m., Working Foreman Frederick J. Thomson climbed a pole, the top of which was being guyed. A span guy had been pulled in from the first pole west of the pole which Thomson ascended to the transformer pole one pole east. This had been placed so that a down guy on the first pole north could be removed. Thomson climbed in the southeast quarter of the pole, lifted the span guy, and placed it across the through bolt supporting the neutral bracket. Then he started to tie in the span guy on the pole.

There were no eye witnesses, but it is believed that Thomson may have felt the necessity for anchoring the span guy by snubbing the tie wire around the pole and for this reason swung from his position in the southeast quarter to a new position in the northwest quarter. It was at this point that he made a head contact with a 7200-v jumper. There was an arc and Thomson fell backwards with his head and hands hanging below his hooks.

Winch Truck Driver Helper Reinhold W. Schultz and Groundman Wilton L. Roberts immediately put up a 24-ft ladder and Schultz climbed to the victim, to whom he started administering pole top resuscitation. In the meantime, Lineman Henry N. Jaeger put his tools on and climbed the pole to a position under Thomson. In "safetying off" he broke one of Thomson's hooks out of the pole and leaned over, attempting to lift the victim across his safety belt. Then Jaeger's hook cut out and the two men fell to a position about 7 ft above the ground before Jaeger could regain his hold on the pole.

Schultz and Roberts, who had removed the ladder, now assisted in removing the victim from the pole to the ground.

In the meantime, Quinn N. Forehand, Serviceman A, and Steve Stravakis, Apprentice Lineman, who were in the vicinity at the time of the accident, had arrived at the scene and had begun to assist in the administration of Schafer method artificial respiration. They were also aided in this effort by Charles Dukes, an employee of the contractor.

Respiration was administered for about 15 minutes before there were signs of breathing, then was continued for another five minutes. By that time an ambulance had arrived. The victim was then removed to a hospital where he was treated for third degree burns on the scalp and on both hands.

EEI Medal Miniatures recognized the joint resuscitation efforts of Henry N. Jaeger, Quinn N. Forehand, Steve P. Stravakis, and Reinhold W. Schultz. Wilton L. Roberts received a Certificate of Assistance. They were presented at the company's annual safety award dinner at the Fort Harrison Hotel in Clearwater on January 6, 1956, by W. W. Wolff, Florida Power Corp. Vice President. In addition to the awards, the men each received two shares of FPC stock from the company. Accounts of the presentation appeared in the January 10, 1956, issue of the *Clearwater Sun*, and the January issue of

Shown after receiving their EEI Medals from Florida Power Corp. Vice President W. W. Wolff (third from left) are (left to right) R. W. Schultz, Q. N. Forehand, Mr. Wolff, Steve Stravakis, H. N. Jaeger, and Wilton L. Roberts. At right is Fred J. Thomson, whose life was saved by his fellow workers.

J. B. Hodge (left) presents EEI Medal to Jerry Anderson, Gulf States Utilities Co., as Anderson Poulson (center) watches.

Power Lines, the company publication.

JERRY F. ANDERSON

Gulf States Utilities Company

On the morning of June 3, 1955, a Gulf States Utilities Co. crew was changing out a transformer near Porter, Texas. Apprentice Lineman John W. Jackson was climbing the pole on which the work was to be done when his left shoulder contacted the 7.6-kv transformer buss. Jackson clung to the pole for a few seconds with both hands around the pole over the ground wire, then fell from the pole and hit a barbed wire fence.

Apprentice Lineman Jerry F. Anderson, who was standing next to the truck nearby, saw the victim fall and ran to him. Lineman First Class Benjamin Z. Masters and Lineman Second Class Robert T. Singletary tried to use truck radios to report the accident, but when their attempts were unsuccessful, ran to telephones to call for aid. Truck Driver Thomas J. Miller also was aiding in the rescue efforts.

The victim began to breathe after about four minutes of artificial respiration. When an ambulance arrived, Masters accompanied the victim to the hospital. Jackson was found to have suffered first and second degree burns to the left shoulder and both hands, abrasions of the left hip, and a fracture of the right clavicle. He was able to return to work on August 11, 1955.

Jerry F. Anderson was awarded an EEI Medal and Certificates of Assistance were authorized for Benjamin Z. Masters, Paul R. Page, Robert T. Singletary, and Thomas J. Miller for the roles they played in the resuscitation. The awards were presented on November 29, 1955, in Cleveland, Texas. An account of the presentation was published in the February issue of *Plain Talks*, company magazine.

VIRGIL KINSEY

Western Light & Telephone Company, Inc.

At 11:00 a.m. on August 3, 1955, in Medicine Lodge, Kansas, Journeyman Linemen Virgil Kinsey and Donald Shelite were working atop a pole to change out a transformer. Shelite was guiding the transformer down the cross arm when he apparently slipped, throwing him off balance and causing him to swing to the left. As he did so, the top of his head struck against a 2200-v conductor dead ended at right angles from his normal position on the pole.

There was an arc and Shelite slumped lifeless. Kinsey immediately swung around and behind Shelite and began pole top resuscitation. This

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Posing after Western Light & Telephone Co., Inc. presentation dinner are (left to right) R. F. M. Guild, E. P. Hennek, D. C. Tinker, EEI Medal Winner Virgil Kinsey, Don Shelite, Earnest Moore, Robert Sanders, Larry Lalicker, and L. M. Snyder.

New England Electric Council Is Formed

THE formation of a new regional electric utility association to be known as the Electric Council of New England has been announced by Sherman R. Knapp, President of The Connecticut Light & Power Co. and first President of the new council. Mr. Knapp also announced the appointment of Capt. Henry A. Ingram as executive director of the Council with headquarters in Boston.

Capt. Ingram said that the formation of the Council will permit the 48 participating New England electric companies to have a continuous and ready interchange of information on engineering, sales, accounting, area development, and advertising matters at a time when electric companies are facing the common problem of meeting steadily increasing demands for electric power within their respective areas.

It is anticipated that committees will be organized, representing the various departments of the electric utility business, which will provide an opportunity for employees of the member companies to participate in the work of the Council. Among the subjects which will be emphasized are safety practices and review of emergency and disaster operating plans.

Capt. Ingram, the Council's Executive Director, is a retired naval engineering officer and a graduate of the U. S. Naval Academy. He has also done post-graduate work at Massachusetts Institute of Technology and the Harvard Business School. During World War II, he was in charge of research in the Bureau of Ships and later served as technical officer on the staff of Commander Naval Forces in Europe. In 1952 he was appointed supervisory inspector of naval material for the New England area, retiring from active duty at the completion of this assignment.

Other Council officers are Howard J. Cadwell, Vice President, and Albert J. McNulty, Treasurer. Mr. Cadwell is president of Western Massachusetts Electric Co., and Mr. McNulty is controller of Boston Edison Co.

Prime Movers Committee Meeting

By J. M. Driscoll, *Chairman*

OVER one-hundred members and guests of the Prime Movers Committee met in Philadelphia for the eighty-seventh meeting of the committee on January 30, 31, and February 1, 1956. The three-day session followed a pattern begun at the preceeding meeting in October to allow adequate time for the consideration of operating experience and difficulties discussed during the round-table period. This schedule had been indicated by an increasing agenda of round-table topics that were not being discussed due to time limitations of the two-day sessions. In this regard particularly, the Philadelphia meeting was successful since each of the more than one hundred topics was considered from the floor.

Although the greatest part of each session is devoted to round-table discussion, the committee reviews on the occasion of its meeting the activities of its 15 subcommittees as well as the progress of the several research projects being sponsored or participated in by the EEI on recommendation of the committee.

Subcommittees' Responsibilities

The responsibilities of the subcommittees include keeping the committee informed of developments in their areas, undertaking studies and investigations which will provide useful data, and recommending and directing research programs designed to further the science of steam power generation. Many of the activities of the subcommittees are directed toward compiling data on practices and experiences of operating companies regarding power station design and operation.

In welcoming the committee to Philadelphia, R. P. Liversidge, Vice President of the Philadelphia Electric Co., called attention to the dramatic growth of the industry since the committee last met in that city eight years ago. A former member of the committee, Mr. Liversidge also referred to the work of the Prime Movers Committee as contributing distinctly to steam generation progress. The range of development in this field during the past several years was emphasized later during the session when K. M. Irwin, Vice President, Engineering Department, and J. H. Harlow, Mechanical Engineer of the Philadelphia Electric Co. described the planning of the new super-critical pressure generating unit at the Eddystone Station.

Turbines and Condensers

The interest of the committee in super-critical generation has prompted the Turbines and Condensers Subcommittee to undertake a study of new units involving cycles utilizing once-through type steam generators. Mr. Estcourt, chairman of the subcommittee, reported that this project will be developed with the assistance of the Boilers and Combustion Subcommittee. The purpose of the review will be to provide committee members with early technical information on the five installations now planned with this type of boiler.

Reporting further on the activities of the Turbines and Condensers Subcommittee, Mr. Estcourt advised that the subject of arrangements for condenser supports is also receiving the attention of the subcommittee. Mr. Benjamin is analyzing data on this subject collected from committee members. Other subjects being considered by the subcommittee are power station practices with regards to fire protective equipment, practices with regard to load pick-up rates, and turbine outage causes.

Boilers and Combustion

Mr. Birget, representing Mr. Parkinson, Chairman of the Boilers and Combustion Subcommittee, reported that the latest subcommittee report is being prepared in printed form as an official committee report. This publication will be available during the latter part of March. The report includes discussions of pressure fired boilers, outdoor boilers, forced circulation boilers, plastic vs steel encased settings, cutting of steam generator tubes by fly ash, superheater and reheater steam temperature control, cyclone fired boilers, soot boilers and boiler cleaning, rate of load pick-up on boilers, and super-critical pressure units. In addition, boiler manufacturers have contributed statesments concerning the designs of their equipment.

Mr. Birget stated that the subcommittee is continuing its study of the subjects discussed in its published report. The current status of super-critical pressure boilers, Mr. Birget advised, is still five on order as reported at the committee's October meeting. However, the manufacturers are receiving many inquiries for information in connection with this type of equipment, and it appears that the greatest interest at the present time is in the pressure range of about 3500 psi.

Mr. Dauber, Chairman of the Power Station Structures and Facilities Subcommittee, reported on progress made by that group on a study of stack designs. Current practices and thinking in regard to this subject have been solicited by a questionnaire and a report will be prepared summarizing the results. This subcommittee is also considering the problem of fire damage to power station roofs because of the roof failures resulting from recent fires. Mr. Dauber pointed out that the subcommittee has also undertaken an investigation of the problem of fish in station circulating water systems.

First Award Presented

The committee was pleased to be advised that the first Prime Movers Committee Award had been presented at the recent Annual Meeting of the ASME. This Award, administered by the ASME, has been established to recognize the authors of jointly authored papers on power generation Mr. Chadwick, past chairman of the committee, advised that the first presentation had been made to authors of papers presented at a recent ASME Seminar on Outdoor Station Design. Included among the recipients were Messrs. Landis, Argue, Duffy, and Estcourt who are members of the committee.

An outstanding feature of the meeting was a discussion by J. R. Carlson, Manager of Engineering, Westinghouse Electric Corp., concerning design details of large steam turbines. Mr. Carlson discussed operating histories of several machines and called attention to metallurgical advancements that have been made.

Following the committee's luncheon on the first day, an Atomic Power Session was held under the auspices of the Atomic Power Subcommittee. Mr. Landis, chairman of the subcommittee, had invited W. Kenneth Davis, Direc-

tor, Division of Reactor Development, Atomic Energy Commission and Vorras A. Elliott, Atomic Power Equipment Department, General Electric Co., to speak to the committee. Mr. Davis traced the history of the Reactor Division of the Atomic Energy Commission and outlined the power reactor development program now in progress. Attention was called to several of the multitude of problems involved in reactor development and the manner in which some of these are being solved. He pointed out the problems involved in maintaining certain critical data under classification while still allowing essential information to be made available so that industrial nuclear power programs will not be hampered.

Mr. Elliott described the 180,000-kw Dresden nuclear power station that will supply power to the Commonwealth Edison System. It is planned that this station will be in operation in five years. Mr. Elliott discussed the salient features of the dual cycle boiling reactor and the other principle equipment.

During the afternoon of the second day, committee members and guests inspected the Cromby Station of the Philadelphia Electric Co.

Transmission and Distribution Committee Meeting

By G. H. Fiedler, *Chairman*

THE winter meeting of the Transmission and Distribution Committee was held on February 7 and 8 at the Warwick Hotel in Philadelphia with 200 members and guests in attendance.

Overhead

The opening session was sponsored by H. L. Livingood, Chairman of the Overhead Subcommittee.

D. F. Tulloch outlined recommendations of the Mutual Assistance Coordination Between Utilities Task Force. These suggest establishment of a national roster of company personnel to contact for emergency assistance and further study of other aspects such as procedures and exchange of weather information.

Mr. Tulloch also described details of the operating plan presently used by the Boston Edison Co. during major emergencies. Recent refinements made as a result of 1954 hurricane experiences stress further decentralization of forces.

F. A. Ashbaugh reviewed eight years' experience with chemical brush control. Although this process was not introduced until 1946, its use developed rapidly and the specific techniques used today had been developed and were fairly well stabilized by 1949. West Penn Power Co. use of chemical brush control has reduced per unit transmission right-of-way maintenance costs to about one-third of former values.

H. Mac Vaugh described the system installed to serve Levittown, Pa., and immediately adjacent areas, totalling 28,000 homes and associated facilities in a 19 square mile area, all built between 1951 and the end of this year. 33-kv subtransmission and 4-kv primaries are used. Distribution is on rear property line poles shared with the telephone company. Service cables are supported from the secondary in the span. Present design utilizes triplex cable supported from a spreader so that all three secondary wires bear the load. All aerial conductors and underground multiple street lighting conductors are aluminum.

Safety

W. J. Witte, Chairman of the Safety Subcommittee, introduced R. H. Coleman, who described the objectives, program, and activities of the EEI Accident Prevention Committee.

The balance of the session on safety was devoted to a symposium on work practices employed on higher voltage primary distribution. D. A. Campbell, Jr., Pennsylvania Power & Light Co.; W. R. Doar, Carolina Power & Light Co.; A. J. Pansini, Long Island Lighting Co.; W. M. Penney, Union Electric Co. of Missouri; and W. L. Ware, Virginia Electric and Power Co., described detailed practices used by their respective companies. All use hot sticks for live line work at these voltages although some permit placement of hose, hoods, and blankets on 7.2/12.5-kv systems with rubber gloves. This group generally agreed that hot stick operation at these higher voltages is even safer than work with rubber gloves at lower voltages. Several also expressed the opinion that although hot stick operation may appear to be slower, the over-all time and cost of maintenance by this method is about the same as by other means if circuits are designed to facilitate hot stick work and crews are well trained.

Underground

The session sponsored by H. E. Cody, Chairman of the Underground Subcommittee, featured discussion of cable troubles.

H. L. Davis, Jr., reported that performance data from the major users of paper and lead, duct-lay cable above 7.5 kv show a trouble rate of 7.9 per 100 cable miles in 1954. This is a slight improvement over 1953 but continues the generally increasing trend over the past ten years. Mechanical damage and corrosion accounted for 46 and 23 per cent of the troubles, respectively.

F. P. West discussed mechanical damage to cables as experienced by the Consolidated Edison Co. of New York, Inc., and described some of the remedial measures being taken. Best possibilities are considered to be improved size and shape of manholes, types of cable better able to withstand expansion and contraction, prevention of damage to cables and joints in manholes, and more careful installation. Efforts to reduce damage during installation have been the most successful since they have resulted in a progressive decline in failures from this cause.

A paper by J. E. Johnson and R. C. DeMarco reviewed cable corrosion control practices employed by the Philadelphia Electric Co. An important feature is the early detection of areas where corrosion failures can be expected to concentrate. Dissection of failures and electrolysis surveys are used to determine the proper mitigative measures. Passive drainage bonds, large point type anodes, distributed anodes buried adjacent to the duct structure, anodes installed in a spare duct and neoprene jacketed cable all

are used as the occasion demands. Cathodic protection obtained from rectifiers is used only as a last resort in order to minimize interference problems involving foreign underground structures.

J. A. Pulsford suggested that modern developments in the design of network transformers and associated network system point toward a simpler, more reliable, and less costly transformer. Specifically, he stressed that hermetically sealed units filled with inhibited oil do not need oil level indicators, filter press connections, drain valves, nor even provisions for oil sampling and testing, and that each merely adds a possible source of leakage. He also suggested that two-position primary switches are adequate for delta-connected primaries.

E. F. Nuezel reviewed progress in development of proposed EEI-NEMA Standards for Secondary Network Transformers. Although a substantial majority of the T&D Committee approved the draft recently circulated for ballot, there were several objections from major users and further efforts are being made to reconcile these to the maximum extent practicable.

Standards and Specifications

M. H. Powell, Chairman of the Standards and Specifications Subcommittee, called on task force chairmen for progress reports.

F. A. Ashbaugh reported that the proposed new specifications for heavy duty Douglas fir crossarms and heavy duty Douglas fir braces and a proposed revision of TD-91, *Specifications for Dense Southern Pine Crossarms, Preservative Treated,* are about ready for ballot. Minor revisions in TD-100, *Specifications for Full-Length, Non-Pressure, Preservative Treatment of Poles,* also are planned.

R. N. Coe reported that fundamental research on aluminum conductor fittings being conducted by Armour Research Foundation has been impeded by difficulties in developing a procedure for surface preparation of conductor and connector which will give reproducible results. He then described the testing methods and results of some of the first tests. This early data is insufficient for drawing any conclusions.

H. Mac Vaugh reported that the Aluminum Conductor Compression Tools and Fittings Working Group is undertaking a program aimed at ultimately developing standard compression sleeves and dies for full-tension splices for aluminum conductors in the range #6 to 400 mcm. Initial efforts will be directed toward sizes #4, #2 and #1/0, since a survey indicates that these account for about 85 per cent of the usage on distribution systems.

F. C. Marschner announced publication of TD-160, *Specifications for Solder-Sweated Split Tinned Copper Connectors.* The Connectors for Underground Cable and Cable Accessories Task Force is continuing work on a proposed specification for straight compression type connectors for insulated copper conductors.

F. E. Moesta announced that proposed EEI-NEMA street lighting equipment standards for steel luminaire supports, film cutouts, high voltage controllers, insulator head and reflector interchangeability, and a revision of existing standards for metal head and reflector interchangeability are ready for ballot. Development of proposed standards for photosensitive devices and multiple lamps and luminaires is progressing satisfactorily and work on newly proposed standards for aluminum poles and aluminum luminaire supports has been initiated.

H. K. Williams reported a favorable letter ballot on the proposal to rescind TD-13, *Specifications for Guy Thimbles.* The Line Hardware Task Force is working on five new specifications and proposed revisions of eight existing specifications. Several of these are about ready to be submitted for ballot.

General Engineering

The closing session of the meeting was sponsored by D. Burns, Chairman of the General Engineering Committee.

L. P. Works reported good progress in assembling a list of industry problems suitable for study by engineering students with the use of existing university equipment.

W. J. McLain presented a report of the Voltage Dip and Short Service Interruptions Task Force showing test data on the use of a constant voltage transformer to modify the undervoltage trip coil characteristics for motors on automatic machines where it is desirable to keep the motors on the line during voltage dips and where no hazards or damage would result from such a practice.

W. R. Bailey of Gar Wood Industries described development of new fiberglass poles and crossarms. Cylindrical, tubular 35-ft poles, 11 inches in diameter develop the strength of Class 6 poles and weigh only 150 lbs. He showed movies of the new poles and crossarms including installation of an experimental 11 pole section by the Consumers Power Co.

T. C. Duncan reported a generally favorable ballot on the Report of the Higher Secondary Voltage Task Force recommending establishment of 265/460Y volts as the preferred nominal voltage with 254/440Y volts as a permissible alternate. The next step will be organization of an EEI-NEMA committee for joint industry consideration of the matter.

G. G. Auer of the General Electric Co. discussed considerations in the application of low-voltage capacitors in series with the primary windings of distribution transformers. Although the series capacitor may be useful in handling low power factor loads requiring a large voltage boost and in providing an automatic type of regulation it introduces operating problems which can be serious. For example, it increases the magnitude of secondary fault currents and may produce serious over-voltages under certain conditions.

W. A. Zander described a new approach to loading series street lighting circuits with mercury vapor or fluorescent lamps which permits utilization of the full capacity of the constant current transformers. This is based on the observation that the minimum starting voltage for an individual lamp in a typical group varies over a range of as much as two to one. Thus when insulating transformers are used to maintain circuit current it is necessary to provide only enough current to establish conduction in some one lamp. The resulting drop in impedance in this lamp then boosts circuit current so that the other lamps cascade into operation.

W. C. Phillips reviewed radio and carrier matters noting the new FCC rules governing incidental radiation, the proposed Conelrad operating procedures, and the proposal to split existing mobile radio channels to provide additional channels. He also discussed proposals by other radio users and by

the FCC which would adversely affect the Power Radio Service. He emphasized that the vast expansion in use of radio and the resultant efforts of others to gain additional spectrum space make it increasingly important to keep a constant vigil over the space available to electric power companies.

Meter and Service Committee Meeting

By G. J. Yanda, *Chairman*

EIGHTY members, correspondents, and guests convened at the Hotel Cleveland in Cleveland, Ohio, on February 20, 21, and 22, 1956, for the joint meeting of the EEI Meter and Service Committee and the AEIC Committee on Metering and Service Methods. The meeting was devoted to the discussion of new developments in meters and metering equipment, development and review of joint industry standards concerning metering, presentation of subcommittee reports, and round-table discussions on the engineering, economic, and operating aspects of revenue metering.

At the Monday morning session, in accordance with established practice, various manufacturers described and displayed new types of meters, metering instrument transformers, and metering accessory equipment.

At a joint luncheon of the committees on Monday, R. M. Besse, Executive Vice President of The Cleveland Electric Illuminating Co., welcomed the committees to Cleveland. He said the most important problem facing the electric utility industry is to please their customers. He continued that this problem was divided into three parts: service-wise, cost-wise, and character-wise. He stressed that, contrary to common belief, the electric utility business was highly competitive. He urged that meter department personnel, because of their close contact with customers, promote good public relations at all times. He also stressed the increased need for research, standardization, and good management development.

Round Table Discussion

W. Jordan led a discussion on the difficulties and expense involved in removing socket type meters, not provided with shunting facilities, from service for testing purposes. For single family residences, no difficulty arises if the customer is merely notified of the presence and purpose of the meter tester. However, for commercial establishments, apartment houses, and doctor's offices, there is difficulty in both locating the customer and obtaining his permission for even a short planned outage. It was pointed out some companies use this opportunity to establish personal contact with the customer and promote favorable customer relations.

A lively discussion on use of manufacturers' serial numbers for meter identification was led by T. E. Lobeck. Opinion is divided on the feasibility and advantages of using either all or part of the serial number for meter identification, but those companies using this system appear well satisfied with the results.

J. F. Cook of The Cleveland Electric Illuminating Co. displayed samples and described both the advantages and methods of mounting 600-v window-type instrument current transformers outdoors near the service attachment. For some types of installations there appear to be material savings effected.

A device for analyzing charts taken from graphic demand meters and a locally designed fuel factor meter were described by representatives of The Illuminating Co. This fuel factor meter is used to control the over-all efficiency of a coal-burning generating plant by providing automatic indications at frequent intervals.

A discussion of the problems involved in deciding whether to repair or retire obsolete watthour meters was led by A. W. Rauth. It was agreed a careful study was necessary before deciding on anything beyond very minor repairs because the cost of repairing can easily exceed the cost of a new meter. However, accounting procedures and special applications sometimes make rebuilding of certain types of meters attractive.

W. H. Farrington discussed the use of potential indicators on watthour meters. The great majority of the membership have discontinued use of potential indicators because the cost and inconvenience of maintaining them far outweigh the advantages. A number of companies are continuing to use potential indicators on the larger metering installations.

A novel plastic meter cover was displayed by J. W. Dye of the Long Island Lighting Co. This cover is used as a replacement for broken glass covers, is purported to be practically unbreakable, and is commercially available for certain common types of meters. The appearance of the cover is similar to the conventional glass meter cover.

The practice followed in installing service entrance switches either outdoors or in an open car-port was discussed by S. B. Vaughn. It appears that in those areas where architectural trends have necessitated this arrangement, experience has been quite satisfactory providing outdoor equipment is used.

C. P. Stahl described various methods of providing service attachments to homes so that suitable clearance of the service drop would result. Practical difficulties encountered with certain arrangements were discussed in detail.

A Universal Meter for Polyphase Circuits

C. V. Morey advocated the adoption of two universal meters, one for metering single phase and network circuits, and the other for metering polyphase circuits. Samples of these meters have been built and were available for examination. He pointed out that adoption of a polyphase universal meter would mean immediate savings for all companies, not only in first cost, but also in simplification of stocks and handling. Such a meter would lend itself well to automation during manufacture.

Mr. Morey also emphasized the continued need for standardization and future planning by the Meter Committees, along with providing increased guidance to the meter manufacturers.

Subcommittee Reports

L. C. Ramon informed the committee that the Transmission and Distribution Committee Task Force studying higher secondary voltages had submitted their report to the Engineering Division Executive Committee. The next step will be formation of a joint EEI-NEMA committee to study the subject.

As Chairman of the Subcommittee on Service Equipment, T. E. Lobeck reported that the revision of MSJ-7, *Standards for Watthour Meter Sockets*, was nearing completion.

E. L. Keller informed the group that the Subcommittee on Meters and

Metering Equipment had again reviewed the seventh draft of MSJ-10, *Standards for Watthour Meters*, and agreed to adoption of the words "stator" and "rotor" in lieu of "element" as a means of describing component parts of watthour meters. After some discussion, the Committee voted to accept Part I of MSJ-10 concerning single stator meters. Mr. Keller said the standard would be reviewed by the AEIC-EEI-NEMA Joint Committee on Watthour Meters and presented to the parent organizations for approval prior to publication.

J. S. Linebeck, Chairman of the Subcommittee on Codes and Rules, reported that the subject of meter performance and required test schedules had been discussed at length by the subcommittee. Suggested changes in the form for recording meter accuracies will be incorporated by the subject chairman, G. F. Austin. It is hoped the member companies will use this standardized form so that information having a common denominator will be available for tabulation and presentation to the committee.

As Chairman of Subcommittee IV, J. A. Morris reported that L. J. Beckwith was initiating a study of various components of keeping meter department records. W. G. Knickerbocker said the response to the initial distribution of the first draft of the revised booklet "Safety Practices for Electric Metermen" had been gratifying. The committee voted to accept the booklet for publication after several minor changes are incorporated. Under the subject of new developments, R. M. Grogan reported that his company was installing an ultra-sonic generator for the purpose of cleaning demand meter registers rapidly.

Electrical Equipment Committee Meeting

By C. L. Derrick, *Chairman*

THE Electrical Equipment Committee held its 68th meeting at The Homestead in Hot Springs, Va., on February 13 and 14, with an attendance of approximately 100 members and guests.

The program of the meeting consisted of the presentation of papers, reports, and discussions under the sponsorship of D. W. Taylor, Chairman of the Subcommittee on System and Apparatus Troubles; R. M. Pennypacker, Chairman of the Subcommittee on Operation and Maintenance; H. E. Deardorff, Chairman of the Subcommittee on System Engineering; and S. C. Townsend, Chairman of the Subcommittee on Apparatus and Design. In accordance with established procedure, the committee devoted most of the first day to a closed session of informal discussion of apparatus troubles and other appropriate subjects.

Fire Protection Symposium

On Monday afternoon, S. C. Hoover of the Subcommittee on Operation and Maintenance sponsored a symposium on fire protection for electrical equipment in generating and substations. J. R. Slack, of the Virginia Electric and Power Co., described typical fire protection policy and practices followed by a company whose new stations have been constructed in rural areas where the only organized fire fighting forces were those of the volunteer groups. J. R. Corcoran, Fire Protection Engineer of the Niagara Mohawk Power Corp., informed the committee regarding his company's formalized policy covering fire protection in general. J. A. McGuckin, of the Philadelphia Electric Co., spoke on fire protection in large urban electric utilities. He advised the committee that his company had a major advantage over some other companies in-so-far-as training of personnel in fire fighting was concerned because of the comparatively small geographical area covered by the system. A fire school was established in 1938 at the Plymouth Meeting Substation and now has a very complete layout of equipment. R. R. MacKay, a member of the EEI Insurance Committee and Chairman of the Joint Insurance, Prime Movers, and Electrical Equipment Subcommittee on Fire Protection, also spoke briefly on the subject of fire protection from the insurance viewpoint.

Tuesday morning was primarily devoted to presentation of the program of the System Engineering Subcommittee. Two papers on system planning under sponsorship of R. G. Meyerand were presented, namely: "Planning the Future System" by W. E. Slemmer of Ebasco Services, Inc.; and "Postwar System Planning and Development, Columbus and Southern Ohio Electric Co." by Fred Campbell. Mr. Slemmer discussed the broad concept of the system planning function. He pointed out that each utility not only must have a good and well-rounded appraisal of its own service territory but a good knowledge of regional, national, and world economic conditions in order to make a dependable estimate of its future growth. The second paper described the results of recent year-to-year planning on almost an emergency basis due to the unprecedented system expansion for a comparatively small company resulting from the consolidation of 56 other companies. Mr. Campbell pointed out that the Columbus and Southern Ohio System is now in good operating condition and it is planned to devote more study to future long range planning.

Intersystem Power Exchange

Under the subject of intersystem power exchange practices, O. E. Charlton sponsored a paper by W. D. Wilder, of the Niagara Mohawk Power Corp., describing the incremental transmission loss slide rule, and by E. D. Early, of Southern Services Inc., describing operating experience with the "Early Bird" economic loading computer. The incremental transmission loss slide rule is well adapted to the present Niagara Mohawk System, but Mr. Wilder said changes in the foreseeable future will so complicate system connections that another method of loss evaluation will be needed. The slide rule has a major advantage because it is simple and rapid to operate, although it is recognized that it can theoretically recover only 70 to 80 per cent of the total savings that could be effected by use of the loss formula method. The "Early Bird" economic loading computer is a device developed by the Southern Company Power Pool to determine the best method of over-all operation at any time; it includes a means of quickly determining the effect of transmission losses, the desirable power output of each plant, and power flow over interconnections, for any total system load. After addition of automatic loading control to the equipment late this year, all steam plants under control will be

(*Continued on page* 96)

Personals

Jay Samuel Hartt has been elected President of Middle West Service Co. to succeed **Edwin Vennard,** who resigned to become vice president and managing director of the Edison Electric Institute. Mr. Hartt headed his own firm of consulting engineers which merged with Middle West in December, 1954. He has been chairman of Middle West's executive committee since that time.

A consulting engineer in the public utility field since 1924, he has represented utilities in valuation and rate cases throughout the United States and in eight foreign countries. Mr. Hartt was operating consultant and engineering advisor to Utilities Power & Light Corp. trustees from 1937 to 1940 throughout the reorganization of that property and served from 1938 to 1945 as co-trustee in charge of operations of Midland Utilities Co.

A graduate of Michigan State University, he has received two awards for distinguished service from that institution, and an honorary degree of doctor of science from Northland College. He is a director of Northern Indiana Public Service Co. and of Eastern Utilities Associates.

Harry M. Miller has been elected President of Columbus and Southern Ohio Electric Co. to succeed the late **John B. Poston.** In addition, **Robert J. Grueser** has been elected a Vice President of the company.

A graduate of Ohio Wesleyan University and Ohio State University, Mr. Miller served three terms, from 1929 to 1935, as Gallia County (Ohio) Prosecuting Attorney. In 1939 he was named executive secretary to Governor John W. Bricker and was appointed to the Public Utilities Commission of Ohio in 1941. From 1947 to 1949, he served as the commission's chairman, and was elected president of the National Association of Railroad and Utilities Commissioners in 1950.

Mr. Miller joined Columbus and Southern Ohio Electric in 1941 as vice president and was appointed executive vice president the next year. He was named a director in 1953 and a member of the executive committee in 1954.

Mr. Greuser, who will be in charge of the company's commercial operations, has been assistant to the president of the electric company since 1950, and has also served as commercial manager.

A group of utility and business leaders recently honored **Granville H. Bourne,** Chairman of the Board of Commonwealth Services, Inc., with a dinner to mark his Golden Anniversary of service in the public utility industry. Mr. Bourne completed 50 years of continuous service with the New York consulting and engineering firm and its predecessors in January.

Mr. Bourne has held various posts with its successor firms since he started in 1906 with Hodenpyl, Walbridge & Co. He became president of Commonwealth & Southern Corp. in 1947, and in 1949 was named president of its successor, Commonwealth Services. His election as board chairman was in June, 1955, when **W. B. Tippy** became president.

Among the industrial leaders who were present for the dinner were **Harllee Branch, Jr.,** President of the Institute and President of Georgia Power Co.; **Justin R. Whiting,** Chairman of the Board, Consumers Power Co.; **Walter H. Sammis,** President, Ohio Edison Co., and former EEI President; **A. B. Brown,** President, Southern Indiana Gas and Electric Co.; and **T. A. Schlink,** President, Central Illinois Light Co.

C. T. Bremicker, Vice President of Sales for Northern States Power Co., has been named Chairman of the National Adequate Wiring Bureau's executive committee. He replaces **C. C. Walker,** Commercial Vice President, General Electric Co.

Mr. Bremicker represents the Institute on the executive committee which includes representatives from various electrical trade organizations. Other organizations in the group are National Electrical Manufacturers Association, National Electrical Contractors Association, National Association of Electrical Distributors, and the International Association of Electrical Leagues.

Chairman of the executive committee of North Central Electrical League, Mr. Bremicker also is a member of the executive committee of the EEI Commercial Division.

R. G. Rincliffe, President of Philadelphia Electric Co., has announced the election of **H. N. Ramsey** as Executive Vice President of the company and of **W. H. Jones** as Vice President in Charge of Purchasing and Service Operations. Mr. Ramsey also was elected a Director, replacing **Edward Porter,** Senior Vice President, who had served on the board since 1943.

Additionally, Mr. Rincliffe announced that the by-laws of the company had been amended to make the president the chief executive officer of the company as well as presiding officer of the board of directors. The office of chairman of the board was eliminated.

Mr. Ramsey entered the utility business as an engineer with the American Gas Co. He was affiliated with United Engineers and Constructors, Inc. and the Welsbach Co. prior to joining Philadelphia Electric as purchasing agent in 1941. He was appointed vice president in charge of purchases, insurances, and real estate in 1948.

A graduate of the University of Pennsylvania, Mr. Ramsey is a member of the Pennsylvania Electric Association, the American Gas Association, the Pennsylvania Gas Association, the National Association of Purchasing Agents, and the Engineers Club of Philadelphia. He is a director of the Central Penn National Bank, a past president of the Engineering Alumni Society of the University of Pennsylvania, a trustee of the University of Pennsylvania, and a trustee of the Northern Home for Children.

Mr. Jones joined the company following his graduation from Cornell University in 1926. His first employment was as a junior engineer. He later became, successively, gas superintendent, electric superintendent, and division superintendent at Morton. He was named purchasing agent in 1949 and manager of pur-

chasing and service operations in 1955.

He is a past chairman and member of the executive committee of the Public Utilities Buyers Group of the National Association of Purchasing Agents, a member of the Purchasing Agents Association of Philadelphia, Pennsylvania Electric Association, Pennsylvania Gas Association, and the American Gas Association.

Four executive vice presidents and two new vice presidents have been elected for American & Foreign Power Co. Inc. Named as Executive Vice Presidents were **Myron C. Reed, William B. Stafford, Grant O. Hylander,** and **Henry W. Balgooyen.** The new Vice Presidents are **Donald G. Lewis** and **Claire M. Titus.**

Mr. Reed will be in charge of operations. Since 1952, he has had regional responsibilities for properties in Colombia, Costa Rica, Ecuador, Guatemala, Panama, and Venezuela.

Heading finance will be Mr. Stafford, who has been financial vice president of the company for several years and a director since 1935.

Mr. Hylander, who was vice president of the firm's service organization, Ebasco International Corp., prior to being named vice president and director in 1952, will be administrative assistant to the president.

Mr. Balgooyen formerly served as secretary and assistant treasurer of Foreign Power and Ebasco. A vice president since 1952, he will be in charge of commercial development and public and governmental relations.

In his new position, Mr. Lewis will have responsibility for system activities in Cuba and Mexico.

Mr. Titus resigned his position as vice president of Arizona Public Service Co. to accept the responsibilities of heading rate matters and personnel for American & Foreign Power.

K. W. Reece, Vice President in Charge of Engineering and Construction, has been appointed Executive Vice President of Ebasco Services Inc.

A native of North Carolina, Mr. Reece is a graduate of North Carolina State College and has done graduate work at Columbia University. He first joined Ebasco in 1925. His many positions with the firm have included those of resident engineer, construction engineer, construction superintendent of engineering and construction projects, general engineer, head of the Appraisal Department, assistant to the vice president in charge of engineering and construction, and engineering manager. Since being named vice president in charge of engineering and construction in 1952, Mr. Reece's duties have included responsibility for the supervision of all appraisal, engineering, construction, purchasing, and inspection work.

He is a member of the American Society of Civil Engineers and The Technical Valuation Society, a registered engineer of the National Bureau of Engineering Registration, and a Professional Engineer in the State of New York and ten other states.

The election of **R. R. Katterhenry** and **W. A. Gentry** as Vice Presidents of Indianapolis Power & Light Co. has been announced.

Solar Heat Pump

(*Continued from page* 80)

this demand is included, the results annual load factor would be materially reduced.

(8) Further study should be made to obtain load factors with the most optimum equipment selection. A combination should be possible whereby the load factor is equal to or better than that existing for a heat pump unit alone.

The above summary indicates the possibilities of combining a solar collector with a heat pump unit. The results of this investigation are not conclusive but they do warrant additional studies. It is apparent that a heat pump system, using solar energy exclusively as the heat source, would be impractical because of the large heat storage requirement needed to supplement the unit during the period when the sun is not shining. Consequently, the capacity of the heat pump, when using air as the heat source, must be sufficient to satisfy the heat requirement, and the solar source, when available, will serve to increase the performance factor. The ultimate goal should be to determine some combination of heat pump equipment, storage system, and solar collector which would provide the best possible annual load factor for the over-all system. An economic comparison with conventional fuel systems and eventually with direct solar heating will be necessary before the final answer to a combination system is obtained.

This study is a preliminary step in the over-all investigation of using solar energy in conjunction with a heat pump. It is hoped it might interest others in continuing research on the subject.

Resuscitation Cases

(*Continued from page* 88)

effort was continued for about five minutes before there were signs of breathing.

After the victim was breathing regularly, Truck and Equipment Operator Robert Sanders, Serviceman Larry Lalicker, and Line Foreman Earnest Moore assisted Kinsey in lowering him to the ground. Shelite was then removed to a hospital where he was treated for electrical shock and burns. He was able to return to work on August 13, 1955.

Their actions earned an EEI Medal for Virgil Kinsey and Certificates of Assistance for Robert Sanders, Larry Lalicker, and Earnest Moore. These awards were presented at a banquet on December 5, 1955, in Medicine Lodge. Vice President D. C. Tinker made the presentation and E. P. Hennek, President of the company, attended the event. Accounts of the presentation appeared in the November-December issue of *The Westerner*, company magazine; in the *Hutchinson Herald* on December 11, 1955, and in the *Barber County Index* on December 8, 1955.

Mr. Katterhenry began his electric utility career in Indianapolis in 1916 after studying electrical engineering in Tri-State College. He served as purchasing agent for many years and is considered an authority on coal supply. He was made an executive assistant in 1944 and an assistant vice president in 1951.

Mr. Gentry has had extensive experience in electric utility operations, in supervisory positions, since his graduation in 1918 as a student engineer at the Westinghouse Plants in East Pittsburgh, Pa. During World War II, he served with the Office of War Utilities in Washington, D. C., and came to Indianapolis 11 years ago to assist in supervising Ipalco operations. He became an assistant vice president in 1951, and now has been elected vice president in charge of operations.

Edward J. Ford, Harold J. Sykes, and **Edwin H. Krieg** have been elected to positions as Vice Presidents of Stone & Webster Engineering Corp.

Mr. Ford, who is senior construction manager with his headquarters in the corporation's New York office, and Mr. Sykes, who is a construction manager in the Boston office, will continue their responsibilities in the direction of construction projects of the organization in the power and industrial fields throughout the world.

Mr. Krieg, recently transferred to the New York office, will continue his activities as a consulting engineer and will devote his attention to the corporation's interests in the steam power and related fields.

At Boston Edison Co., **Chester A. Corney** has been named as Vice President in Charge of Engineering and Construction, and **Brig. Gen. Timothy J. Regan, Jr.** as Vice President — Employee Relations. They succeed, respectively, **John T. Ward** and **Arthur J. McEachern,** who have retired.

Mr. Corney taught for one year at Massachusetts Institute of Technology following his graduation there, then was associated with Stone & Webster Engineering Corp. He has served as superintendent of electrical engineering and assistant vice president of engineering and construction since joining Boston Edison in 1922. Subsequently he has served as district manager, division head, assistant vice president, and public relations director.

Vernon M. F. Tallman has been elected Vice President of six utilities under the management of a Boston group formerly headed by the late **Col. Charles H. Tenney.** Present electric operating properties include Rockland Light & Power Co., Concord Electric Co., Fitchburg Gas & Electric Light Co., and Exeter & Hampton Electric Co. Two gas companies, serving Brockton and Taunton, Mass., are also in the group.

Levittown

(*Continued from page* 85)

Gross estimated peak demand	50,000 kw
Average annual electric revenue per residence customer	$125.00
Total 1949 value of the area of 12,000 acres, with improvements	$2,500,000
Total 1956 value of this area, with improvements	$400,000,000

Now I'd certainly be remiss in common decency if I didn't, before ending this paper, state as positively as I can the complete satisfaction that we in the Philadelphia Electric Co. have had in dealing with the Levitt organization. We have found these people intelligent operators, completely trustworthy, public spirited, and entirely reasonable in working out a solution to a mutual problem. I can't express a higher opinion of any organization. Another group I shouldn't forget is The Bell Telephone Co. of Pennsylvania. Without the spirt of cooperation and ability to produce almost endless pole installations, on time and in the right locations, and with very little argument or discussion, this job would have been a major headache, instead of a smooth piece of mere hard, steady work that it was and still is. With these two well deserved orchids, I've finished.

Electrical Equipment

(*Continued from page* 93)

automatically loaded for equal incremental cost of delivered power, the condition for lowest system power cost.

A. V. DeBeech, Chairman of the Foreign Practice Subcommittee, described the difficulties encountered in London in locating substations and distributing electricity. He said the large number of old buildings having historical interest complicated matters.

The program of the Apparatus and Design Subcommittee consisted of presentation of three papers on station design under sponsorship of J. W. Bennett. The electrical features of Shippingport were described by E. W. Gue, of the Duquesne Light Co. This plant will be the first full-scale nuclear electric power station completed in the United States. Mr. Gue pointed out that the anticipated station service load will be about 10 per cent of the hoped for 100-mw output that the main turbine generator unit is capable of. This contrasts to station load in conventional plants of approximately 5 or 6 per cent. The Roanoke Rapids Hydroelectric Project of the Virginia Electric and Power Co. was described by W. N. Thomas. This project, commenced in 1953, was substantially completed late in 1955.

The final presentation consisted of an illustrated lecture by W. S. Brokenshire, of the Pennsylvania Power and Light Co., describing mechanization in station construction. Pictures of various unique machines and novel methods of constructing both substations and transmission lines were shown to the committee.

World Power Conference General Programme Available

THE General Programme for the Fifth World Power Conference, to be held in Vienna, Austria, June 17-23, 1956, is now available for the United States National Committee, World Power Conference, 29 West 39th Street, New York 18, N. Y.

Information about all phases of the Vienna Conference—technical sessions, social events, excursions, and study tours—is contained in the General Programme. Also included are forms for registration, excursions, travel and hotel accommodations, and post conference tours.

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, N. Y.

o, Calif.
n, Wis.
, N. Y.
, Mich.
, N. Y.
y, Okla.
, N. Y.
, N. Y.
n, Ohio
, N. Y.
rgh, Pa.
re, Md.
, Conn.
, Mont.
, N. Y.
k, N. J.
nta, Ga.
, Mich.
nta, Ga.